SCIENTIFIC AMERICAN

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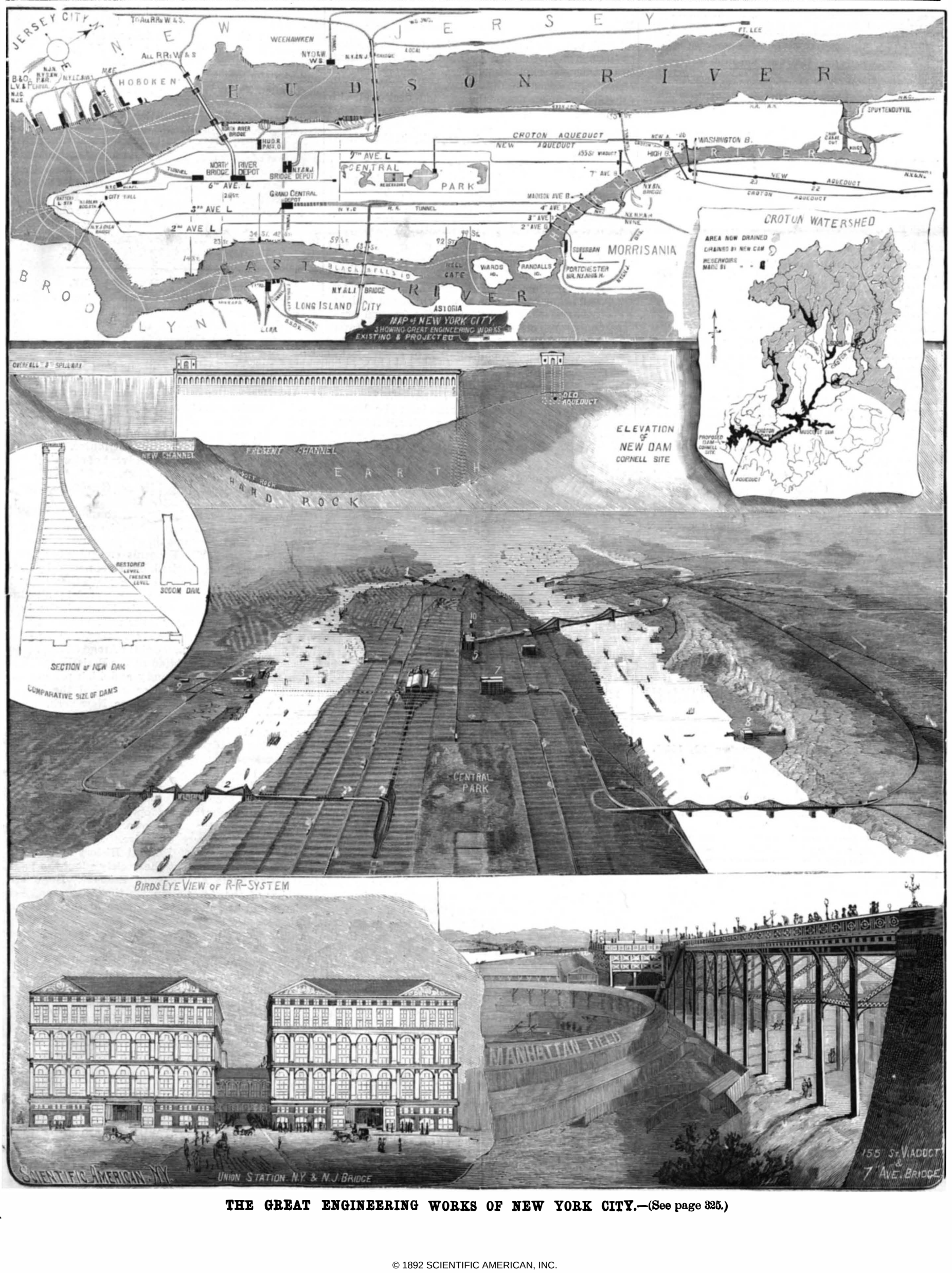

THE GREAT ENGINEERING WORKS OF NEW YORK CITY.—(See page 325.)

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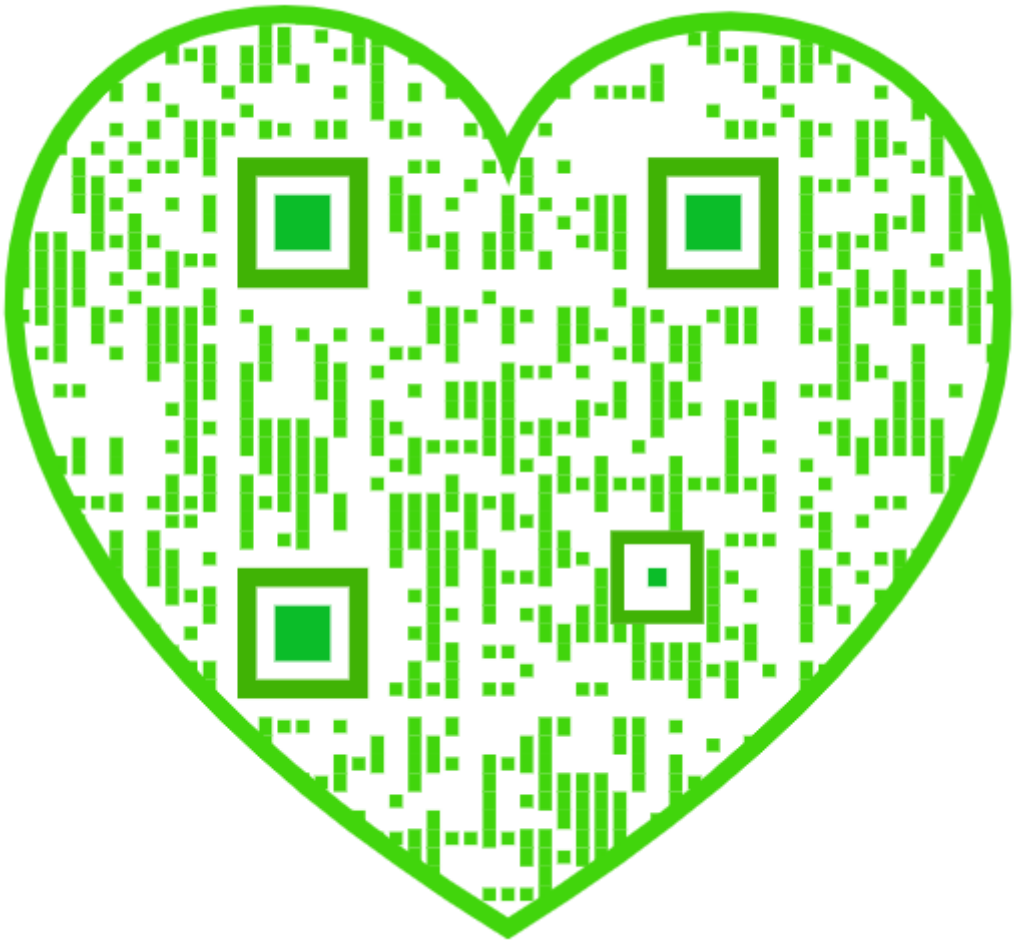

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LAUNCH OF THE CRUISER CINCINNATI.

Another valuable addition to our growing new navy was made in the successful launch, on November 10, at the Brooklyn Navy Yard, of the 3,000 ton protected cruiser Cincinnati. The new vessel is one of the fleet of smaller steamers, swift and unarmored, and having highly efficient batteries, which the government is building instead of the much larger, heavily armored, and far more expensive battle ships, in which foreign countries have invested so much money. The Cincinnati is being built at the Brooklyn Navy Yard because all the bids for her construction by private establishments exceeded the appropriation for her cost, which was $1,000,000; and a sister ship, the Raleigh, launched some time since, is being built at the Norfolk Navy Yard.

The Cincinnati is of 3,183 tons displacement, having a length of 300 feet, a beam of 42 feet, and a depth of 23 feet 9 inches. She is a steel built ship throughout, fitted with 106 compartments. Her complement will consist of 24 officers and 266 men in the crew. She is provided with an armored protected deck and with engines calculated to develop 10,000 indicated horse power. Her speed is estimated at nineteen knots per hour. She has a coal-carrying capacity in the bunker of 556 tons.

The main battery consists of one 6 inch and ten 5 inch rapid-fire breech-loading rifles on center pivot mounts, protected by thick steel shields. Two 5 inch guns are placed on the poop, two under the poop in sponsons, two under the forecastle in sponsons, and the other four, two on a side, in sponsons. The secondary battery consists of eight 6 pounders, four 1 pounders, and two Gatling guns. There are four torpedo tubes, with openings about four feet above the water, worked from the berth deck, fixed tubes forward and aft, and the other two, which are training tubes, are placed at the sides on the forward berth deck. The tubes are of the Whitehead and the Howell pattern, using gunpowder impulse. The rig is that of a two-masted schooner, spreading 7,210 square feet of sail. The foremast has a barbette gallery for machine guns just below the top. The vessel is lighted by electricity and is thoroughly ventilated.

Aboard the Cincinnati little remains to be done on the cruiser to complete it. Her construction is so far along as to show the upper decks laid down and calked. Below decks most of the woodwork is in place, though all the fine paneling and furniture with which the ship will be supplied still remain in the joiner shops of the Brooklyn Navy Yard. The joiner work is made up of mahogany and butternut wood. Large and capacious desks are provided for each stateroom, and above these desks are to be mirrors larger in size than any provided for the new war ships. The engine and boiler rooms of the Cincinnati are as yet unprovided, but the engines and boilers for the ship are at present housed in the shops of the department of steam engineering of the Brooklyn Navy Yard. The engines are all ready for setting up aboard the new vessel. The shafts are now in place, though without the propellers being in position. The propellers and hubs will be placed upon the shafts when the cruiser is admitted to one of the dry docks.

THE AMERICAN MUSEUM OF NATURAL HISTORY.

The new building of the American Museum of Natural History was transferred from the city to the trustees on Nov. 2, with appropriate exercises; the speakers being the Hon. Paul Dana, Hon. Seth Low, Bishop Potter and Mr. Jesup, President of the Board of Trustees. The new building adjoins the old one, both together forming only a small portion of the contemplated design. The new part is built in the Romanesque style. It is three stories in height, with a basement, and is approached by an imposing flight of steps, under which there is a *porte-cochere.* The building is entirely fireproof, the floors, walls and ceilings being iron, stone, brick or tile. The buildings are lighted throughout with the incandescent electric light. The warming and ventilation is carried out according to approved modern methods. One interesting feature is the free use of wrought iron in the construction of the building. The two elevators in the new building have cars which are treated in a very effective manner in wrought iron. The library in the upper floor contains about 25,000 volumes and is separated from the reading room by a highly artistic wrought iron screen, and even the shelves themselves are of iron. The loftiness of the ceilings and the breadth of the corridors recalls the Museum of Natural History at South Kensington. The arrangement of the museum has been much changed and improved. The lighting was severely tested on the opening day, which was very dark and foggy, but the window space proved ample even under these trying conditions.

In the basement of the new building is a large lecture hall, in which are two screens and two sets of lanterns, so that if desired two subjects or two parts of the same subject may be kept in view at once. The educational value of both the mineralogical and geological collections is greatly enhanced by their being separated. One of the latest acquisitions is a section of a gigantic redwood tree, twenty-two feet in diameter, forming a part of the Jesup collection of woods.

New York may well be proud of this institution, and it is to be hoped that as much money will be appropriated from the public funds as is consistent with the other needs of this great city. It is to the credit of the municipal authorities that nearly two millions of dollars of the public money has been expended on buildings and maintenance since the collection was moved from the old armory building.

PROGRESS OF AMERICAN STEAMSHIP BUILDING.

The fast steamships City of New York and City of Paris are soon to change their port of calling from Liverpool to Southampton, England. This, it is said, will reduce the time of passage to and from New York by some three hours, avoid serious delays, and improve the facilities for passengers in reaching London and the Continent. The change takes place in March next, when the two steamers will sail under the American flag.

The International Navigation Company, of New Jersey, owners of the above vessels, has entered into a contract with the Postmaster-General for the transportation of the mails, under the terms of which additional new steamers are to be built in this country, equal or superior to the two above mentioned; also new steamers to be run between New York, France, and Belgium. The cost of these vessels will be about nine millions of dollars. They are to be so constructed as to be capable of use as vessels of war in case of necessity. The new ships are to be finished in 1895.

PROFESSOR CHARLES A. SEELEY.

Professor Charles A. Seeley died at Mount Vernon, N. Y., November 4, 1892. He was born at Ballston, N. Y., on November 28, 1825, and was graduated with honors from Union College, in 1847. He received the degree of Ph.D. in 1878. He was appointed professor of chemistry and toxicology in the New York Medical College in 1859 and resigned in 1862. When the New York College of Dentistry was incorporated in 1867 he filled the chair of chemistry. He was for several years a member of the editorial staff of the SCIENTIFIC AMERICAN, and after his resignation continued long to write for the paper as a contributor. He was among the first to foresee the advent of electric lighting. In 1861 he formed the American Electric Light Company, and he interested Horace Greeley in it, who served as one of the trustees. In the early days of dynamo designing Dr. Seeley devoted considerable attention to obviating loss of energy in the iron core of the armature. His theory was that it proceeded from two causes: 1, the so-called Foucault currents; 2, a phenomenon then unrecognized, but since named by Professor Ewing hysteresis; and Dr. Seeley's theories, not then generally received, are now adopted by all educated electricians. Dr. Seeley's ideas of the best method of obviating these losses resulted in an electric lighting machine with a coreless armature of a disk form. Under the name of the Arago disk dynamo this generator was exhibited at the Paris Exposition, where it received careful study and high praise from M. Th. Du Moncel, and was awarded the bronze medal, White House Mills, Hoosac, New York, being the exhibitors. In 1882, at the Crystal Palace, London, the same exhibitors were afforded better opportunities for showing its advantages in competitive trial with other generators, the lamps used being the Swan incandescent and the Lane-Fox lamps, and it was awarded the gold medal. In London Sir William Thomson might have been seen almost daily studying this dynamo, and afterward adopted its principal features in a generator of his own. His knowledge of the sciences was very extensive. He was a member of the Lyceum of Natural History and one of the first to advocate that the society adopt the more distinctive name Academy of Sciences. He was a member of the Association for the Advancement of Science and Art, and a life member of the American Institute. Dr. Seeley discovered a process for making carbolic soap, a process for preserving wood, a process for making grape sugar, and a process for making hop extract, and invented the machinery used in the process. He was employed as chemical expert in patent litigations from 1865 to 1886. He possessed the rare faculty of explaining in a very clear, concise and interesting manner the material facts of a case. In some cases the judges adopted his language in their decisions. He was a most excellent counselor, able and efficient in whatever he undertook. He was extremely kind hearted, faithful and devoted as a friend, and unassuming in character.

In 1872 District Attorney Benjamin Reynolds, of Sullivan County, engaged him to make the analysis in the case of Mrs. Charlotte Litts. His analysis proved the presence of arsenic in sufficient quantities to cause death, and his exhibits and explanations produced a profound sensation in the court room. Dr. Seeley married, in 1863, Miss Caroline A. Boltwood, of Amherst, Mass. Two sons and a daughter survive him.

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A NATURALIST IN LA PLATA.

Few books of interest to the naturalist have attracted so much favorable comment in the last year as the work by Mr. Hudson, on his life and experiences on the La Plata, in the Argentine Republic. Here, in the flat grass-covered pampas bordering this river and stretching in an illimitable sea of feathery spikes as far as the eye can follow its fluctuating surface, Mr. Hudson has, with a painstaking love, watched the wild denizens of this great plain, taking affectionate note of the biggest and the least. His own words are so beautiful and graphic, in which he describes the glorious pampas grass, that the reader feels transported to the singular and lovely scene, where it fills everything with its presence. He says: "The plant is social, and in some places, where scarcely any other kind exists, it covers large areas with a sea of fleecy white plumes. In late summer and in autumn the tints are seen varying from the most delicate rose, tender and illusive as the blush on the white under-plumage of some gulls, to purple and violaceous. At no time does it look so perfect as in the evening, before and after sunset, when the softened light imparts a mistiness to the crowding plumes, and the traveler cannot help fancying that the tints, which then seem richest, are caught from the level rays of the sun, or reflected from the colored vapors of the afterglow."

The life of these weird expanses has been studied by Mr. Hudson with diligence, and he has given to his observations a peculiar original value, for he has traced the reflections which they suggest in reference to the wider questions of animal economy and origin.

Mr. Hudson says the mammalian life of the pampas is restricted, being composed for the most part of the common rodent, the vizcacha, the Patagonian hare, the coypir, "a brown animal with bright red incisors, a rat in shape, and as large as an otter," a small, mouse-colored creature, "with a low, gurgling language, like running, babbling waters;" and an interesting animal called the *tuco-tuco*, from its singular cry, "for all day long and all night sounds its voice, resonant and loud, like a succession of blows from a hammer, as if a company of gnomes were toiling far down under foot, beating on their anvils, first with strong, measured strokes, then with lighter and faster, and with a swing and rhythm as if the little men were beating in time to some rude chant unheard above the surface." Besides these are found the great carnivores, the jaguar and puma, two large cats, the grass and wood cat, two canines, the "pestiferous skunk," the ruminant deer (*Cervus campestris*), the male of which emits a "rank, musty odor, so powerful that when the wind blows from it the effluvium comes in nauseating gusts to the nostrils from a distance exceeding two miles," armadilloes and opossums. There is a numerous bird life, and the omnipresent and diversified insect fauna, with its oddities of habit, and a restricted batrachian and reptilian population.

Our author dwells with much fondness on the rhea, the ostrich-like tenant of these boundless prairies, which has a long ancestry of extinct forms and is itself a relic of a past when its progenitors approached near in time to the glyptodon and megatherium. He says: "Its commanding stature gives it a wide horizon; and its dim, pale, bluish-gray color assimilates to that of the haze, and renders it invisible at even a moderate distance. Its large form fades out of sight mysteriously, and the hunter strains his eyes in vain to distinguish it on the blue expanse. Its figure and carriage have a quaint, majestic grace, somewhat unavian in character and peculiar to itself. There are few more strangely fascinating sights in nature than that of the old black-necked cock bird, standing with raised, agitated wings among the tall-plumed grasses, and calling together his scattered hens with hollow boomings and long, mysterious suspirations, as if a wind blowing high up in the void sky had found a voice."

A very curious series of anecdotes are given to prove the inexplicable friendliness exhibited for man by the puma, the agile and remorseless panther who destroys the deer, the horse and huanaco, ravages the sheep folds and faces with success the powerful but sluggish jaguar. This dangerous beast seems touched in the presence of man with a strange humility, and this "mysterious, gentle instinct" has secured for it the pleasant appellation of "amigo del cristiano," or friend of the Christian. It has been known to leap and gambol about a defenseless traveler, purring, and winding with terrifying playfulness about his legs, and in captivity, if domesticated when young, it assumes the nature of a monstrous cat. Perhaps the most striking anecdote given by Mr. Hudson in proof of his singular assertions is the following: "A gaucho, while looking with a companion for cattle, found a puma. It sat up with its back against a stone, and did not move even when his companion threw the noose of his lasso over its neck. My informant then dismounted, and, drawing his knife, advanced to kill it; still the puma made no attempt to free itself from the lasso, but it seemed to know, he said, what was coming, for it began to tremble, the tears ran from its eyes, and it whined in the most pitiful manner. He killed it as it sat there unresisting before him, but after accomplishing the deed felt that he had committed a murder." It seems that in California, in the earliest days of its occupancy by men, the pumas increased prodigiously, because they were superstitiously regarded by the natives as friendly animals, and unmolested in consequence.

In a chapter on "Curious Animal Weapons" our author describes a curious and new frog, provided with bulging and vigorous muscles on its fore legs with which it grasps an intruder or enemy, and, squeezing it tightly, suddenly relaxes its embrace, taking advantage of the surprise or prostration caused by its violent hug to effect its escape. He describes also the "venomous toad," producing a very disagreeable picture. He says its "skin is of a rich brilliant green, with chocolate colored patches, oval in form, and symmetrically disposed. The lips are bright yellow, the cavernous mouth pale flesh color, the throat and under surface dull white. The body is lumpy, and about the size of a large man's fist. The eyes, placed on the summit of a disproportionately large head, are embedded in horn-like protuberances, capable of being elevated or depressed at pleasure. When the creature is undisturbed, the eyes, which are of a pale gold color, look out as from a couple of watch towers, but when touched on the head or menaced, the prominences sink down to a level with the head, closing the eyes completely, and giving the creature the appearance of being eyeless." These disgusting objects bite savagely and hang on to their victim with the tenacity of a bull dog, poisoning the blood with glandular secretions. When teased it swells up most loathsomely and follows its tormenter about with clumsy jumps, its big mouth wide open, and uttering an incessant croak.

Mr. Hudson devotes a chapter to the "mephitic skunk," and empties upon its devoted head all his contempt and horror. It does not assume or wear those attractive features which Prof. Merriam, with singular eccentricity, assigns to it. He execrates its awful odor, and proves what an extraordinary weapon of defense this odor is to it, and how powerless are its worst enemies in the face of its suffocating discharge. He gives an illustrative anecdote. He took with him one day a dog of his brother's, a greedy, large brute of force and courage, and found a skunk, and he writes, "For upward of half an hour I sat on my horse vainly cheering on my cowardly follower, and urging him to battle. The very sight of the enemy gave him a fit of shivers; and when the irascible little enemy began to advance against us, going through the performance by means of which he generally puts his foes to flight without resorting to malodorous measures—stamping his little feet in rage, jumping up, spluttering and hissing and flourishing his brush, like a warlike banner, above his head—then hardly could I restrain my dog from turning tail and flying home in abject terror. My cruel persistence was rewarded at last. Continued shouts, cheers, and hand clappings began to stir the brute to a kind of frenzy. Torn by conflicting emotions, he began to revolve about the skunk at a lumbering gallop, barking, howling, and bristling up his hair; and at last, shutting his eyes, and with a yell of desperation, he charged. I fully expected to see the enemy torn to pieces in a few seconds, but when the dog was still four or five feet from him the fatal discharge came, and he dropped down as if shot dead."

Mr. Hudson enters into some suggestive speculations as to the blood-sucking habits of mosquitoes, bringing out forcibly the inexplicable anomaly of a parasitical insect subsisting, for the most of its time, and in the great majority of its representatives, upon water or vegetable juices, and yet possessing the most remarkably perfected apparatus for perforating and extracting the blood of flesh. He says "there is not in all organic nature, to my mind, any instance of wasted energy comparable in magnitude with the mosquito's thirst for blood, and the instincts and elaborate blood-pumping apparatus with which it is related." It seems irresistibly forced upon our acceptance that, from an evolutionary point of view, we must regard the mosquito as an insect that has changed its habit, and yet retains an appetite correlated with a highly organized implement for feeding it, which are an inheritance from a long-distant past, when it preyed upon mammalian tissues solely. Mr. Hudson very strikingly remarks: "In any case, how unsatisfactory is the mosquitoes' existence, and what a curious position they occupy in nature! Let us suppose that, owing to some great change in the conditions of the earth, rapacious birds were no longer able to capture prey, and that, by a corresponding change in their organizations, they were able to subsist on the air they breathed, with perhaps an occasional green leaf and a sip of water, and yet retained the old craving for solid food, and the old predatory instincts and powers undiminished; they would be in the position of mosquitoes in the imago state. And if then fifty or a hundred individuals were to succeed every year in capturing something and making one hearty meal, these few fortunate diners would bear about the same proportion to all the raptors on the globe as the mosquitoes that succeed in sucking blood to their unsuccessful fellows."

The spiders of the La Plata afford interesting subjects of observation to our naturalist, and he advocates a theory of migration to explain the floating hosts of these gossamer bodies in the autumn, when "the whole sky may be filled with visible masses of floating web." Among the spiders he describes a singular species of Lycosa, which is swift and most irritable, starting up from its lair at the slightest approach and flinging itself on its intruder. He says that on one occasion, while riding at an easy trot over the grass, he observed this spider pursuing him with rapid leaps and keeping up with the horse. He struck at the resolute little footpad with his whip, when it leaped upon the lash, ran up the handle and compelled the surprised traveler to throw whip and spider away from him.

He describes the felicitous instinct of a small parasitical fly, a species of Ornithomyia, which lives upon the body of a small dendrocolaptine bird which, from its habit of gathering together an enormous nest of sticks, is popularly known among the gauchos as the firewood gatherer. This little torment is eagerly hunted for by the bird, but it possesses extraordinary facility of swimming through the plumage of its hosts and almost invariably escapes capture. But when the birds leave the nest this wary parasite does not always accompany them, but remains behind in the numerous lurking spots among the litter of the nest, and then with the *abandon* of the domestic fly springs upward and "wheels about in the air above the nests, hovering and gamboling together, just like house-flies in a room in summer; but always, on the appearance of the birds, returning from their feeding grounds, they instantly drop down and disappear into the nest." A curious and subtile instinct which makes them fear their host upon whose tissues they are supported! Mr. Hudson adduces a curious illustration to emphasize this singular association. "A man with a blood-sucking flat-bodied flying squirrel concealing itself among his clothing and gliding and dodging all over his body with so much artifice and rapidity as to defeat all efforts made to capture it or knock it off would be a case parallel to that of the bird fly on the small bird."

Two more subjects should be mentioned before leaving this fascinating volume. One is that of dancing birds and the other the strange and weird habit of the huanaco of retiring to a place of seclusion, visited by thousands of his ancestors and companions for the same purpose, wherein to die. "The terrestrial dances, often very elaborate, of heavy birds, like those of the gallinaceous kind, are represented in the more volatile species by performances in the air, and these are very much more beautiful; while a very large number of birds—hawks, vultures, swifts, swallows, nightjars, storks, ibises, spoonbills, and gulls—circle about in the air, singly or in flocks. Sometimes, in serene weather, they rise to a vast altitude, and float about in one spot for an hour or longer at a stretch, showing a faint bird cloud in the blue, that does not change its form, nor grow lighter and denser like a flock of starlings; but in the seeming confusion there is perfect order, and amidst many hundreds, each swift or slow gliding figure keeps its proper distance with such exactitude that no two ever touch, even with the extremity of the long wings, flapping or motionless; such a multitude, and such miraculous precision in the endless curving motions of all the members of it, that the spectator can lie for an hour on his back without weariness watching this mystic cloud dance in the empyrean." He describes the curious saltations of the ypecaha rails, with their vociferous concerts of wild screams; the wing displays of the iacanas and the minuet and attitudinizing efforts of the spur-winged lapwings.

The huanaco, which is a small camel which is widely distributed in South America, has a peculiar instinct of repairing to some lonely, deserted spot when seized with the pangs of death, and, removed from all its healthy companions, succumbing to its last sickness in a sort of dismal yet poetic isolation. Darwin and Fitzroy have noted this strange custom, and Mr. Hudson dwells at some length upon its unique suggestions. "It looks, in fact," he says, "less like an instinct of one of the inferior creatures than the superstitious observance of human beings, who have knowledge of death, and believe in a continued existence after dissolution."

Mr. Hudson is inclined to explain this almost mysterious practice with the huanaco by the assumption of an immense antiquity for the species, and that the inherited habit of a far distant period, when its representatives resorted to some secluded place protected from the assaults of their enemies, has been impressed upon the stock, so that by an automatic movement, when sickened with disease or old age, it turns to the hidden refuge which generations of its kind have sought in the same blind manner.

The numerous observations of the "Naturalist in La Plata" have been barely suggested in this notice. The book will reward all its readers with entertainment and instruction. L. P. G.

IN Germany's public schools stuttering boys are over twice as numerous as stuttering girls.

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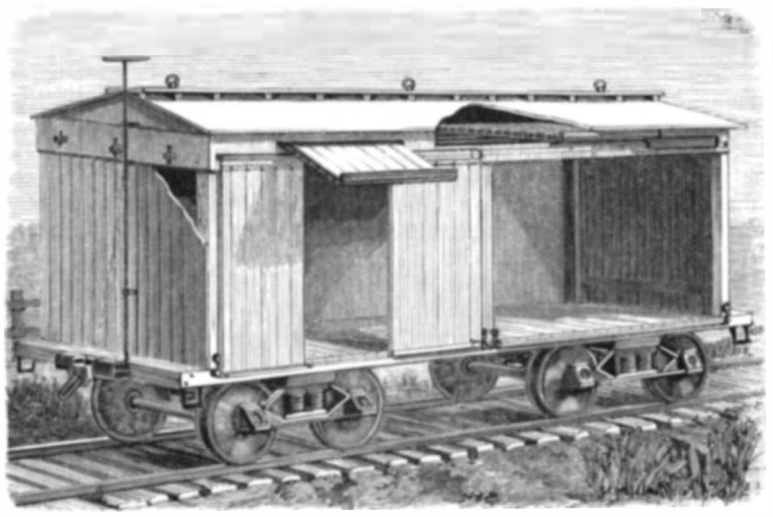
AN IMPROVED RAILROAD CAR.

A car designed to be readily changed from a box car to an open or platform car, or *vice versa*, and which may be readily opened at any part to facilitate loading or unloading, is shown in the accompanying illustration, and has been patented by Mr. De Witt B. Williams, of La Mesa, Cal. On the four corners of the platform are posts connected at their upper ends by a rectangular band, preferably of metal, on which is supported the roof, the latter being formed with a flange to engage the inner side of the band. On the top of the roof are eyes or hooks to be engaged by the chains of a derrick or other hoisting apparatus, to remove the roof or place it in position on the band. The ends of the car are preferably of solid boarding, but the sides consist of a series of overlapping doors, the upper end of each of which has an L-shaped flange engaging a slot in the band, permitting the door to hang vertically or allowing it to be moved inward in a horizontal position near the top of the car. The door is swung outwardly, as shown, to permit of its being moved into horizontal position, where it is supported upon removable longitudinal rods held in sockets in the ends of the car. The lower end of each door has an outwardly turned flange, and is engaged by a longitudinal locking bar connected at one end by a link with the corner post, while its other end is secured to a middle post by a padlock.



WILLIAMS' IMPROVED FREIGHT CAR.

Charlotte de Russe.

This delicacy is made in two ways: 1. Put rich sponge cake on the bottom and sides of a glass bowl and fill in with cream. Take a decorating bag, fill with the cream and ornament. May be finished by arranging a few French cherries on the top. 2. Line the pasteboard cups, that are made for the purpose, with lady fingers. Put the cream into a lady finger bag, fill the cups up, bringing the cream to a point, place a piece of French cherry on top. This adds to appearance. Recipe for cream: 1 quart rich cream, two days old, 1 pound powdered sugar, 1 teaspoonful vanilla. Whip the cream in a pan or kettle with a wire wisp until it is quite thick, then add sugar and flavor. Some use gelatine, but this is not necessary when the cream is good.—*The Helper.*

A LARGE LAKE FREIGHT BOAT.

The fine four-masted schooner shown in the illustration was built by Messrs. F. W. Wheeler & Co., of West Bay City, Mich. She is one of the largest and finest vessels yet built of her class, and, none of her room being taken up by boilers and engines, or required for the stowage of coal, her freight-carrying capacity is very great. The competition of even the best built and most economically operated steamers with such vessels as the Fitzpatrick must always be a difficult matter; but the handlers of the great freight business offering on our Western lakes are only able to do the work at the present low rates on account of such competition and the very close economies thus necessitated.

Alloys Made by Compression.

In a recent meeting of the Amsterdam Royal Academy of Science, Mr. Behrens dealt with specimens of brass made by compression of the constituents, at ordinary temperature, by Prof. W. Spring, Liege, Belgium. One of the specimens was of a reddish color, and had been produced by compressing a mixture of copper and one of zinc, another, pale yellow, by compressing seven parts of copper and three parts of zinc. Both specimens had been filled up twice and again consolidated by pressure. The reddish metal was a little softer than common cast brass; it could be somewhat flattened under the hammer. The yellow metal was harder than common brass and brittle. Both varieties contain a great quantity of yellow alloy, which seems to be in an amorphous state, showing a uniform, finely granular appearance, without any vestige of the beautiful crystallites so characteristic of copper-zinc alloys obtained by fusion. Further, there were a good many angular fragments of red copper, some of them cracked and doubled up, with yellow threads between the red lumps and strands, and finally some zinc, angular fragments and threads, trending outward, and uniting near the curved surface of the cylindrical specimens. The metal is nearly but not wholly compact. There is much that gives evidence of a flow in the yellow alloy and in the zinc, but nothing pointing to a truly liquid state of the alloy or one of its components. Regelation seems to be put aside, while there does not remain any doubt that zinc and copper have been intimately mixed and actually united by repeated fillings and compression. Scientists say that a more complete union of metallic powers by compression will lead to alloys of most remarkable properties, and may give some alloys that cannot be produced by fusion.

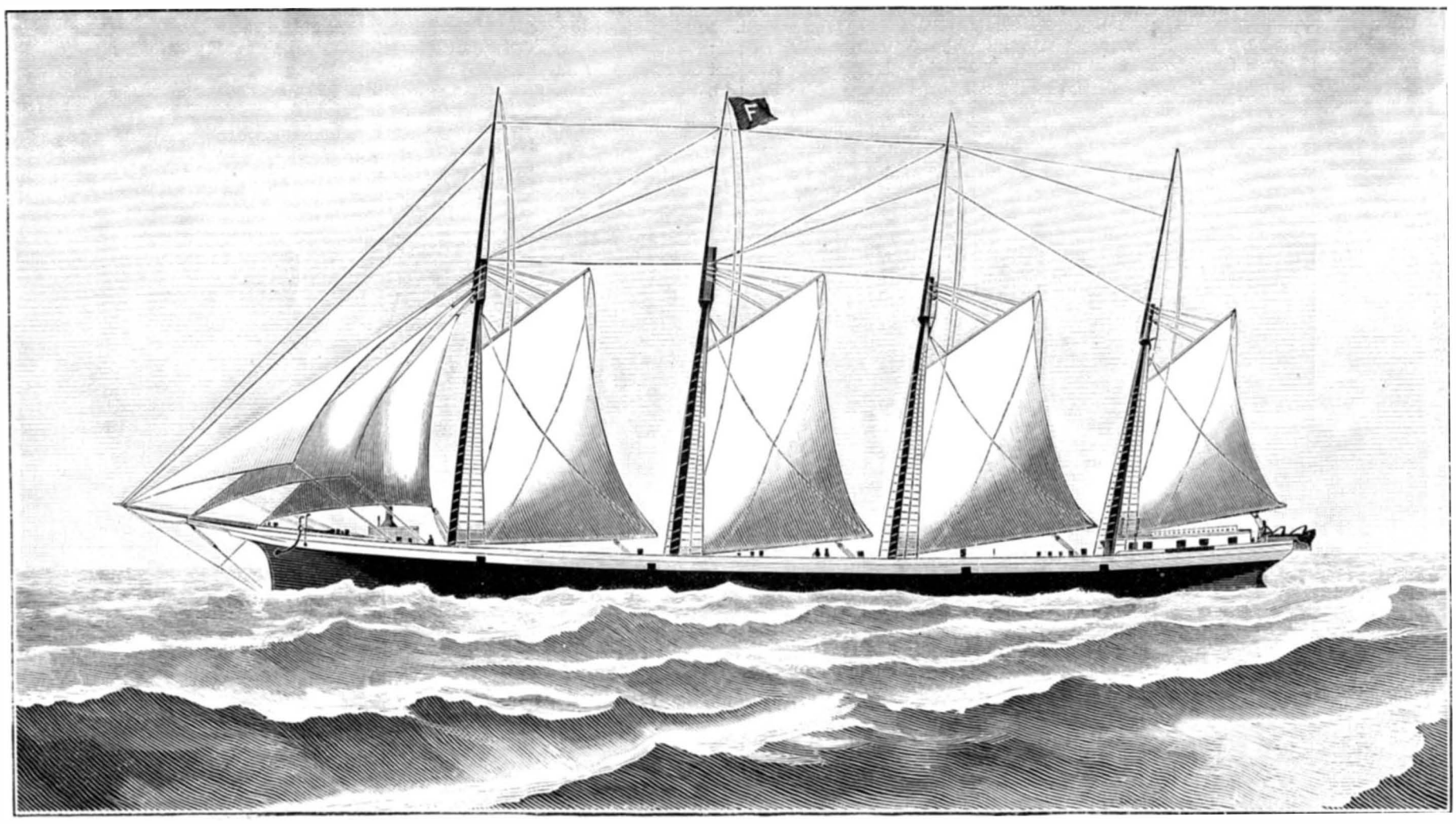
Parasitism in Bees of the Genus Stelis.

That the Apid genus Stelis develops in the cells of the allied genus Osmia has been known for some time, but the exact nature of the parasitism, and more especially when and how the Osmia larva is destroyed by the Stelis larva, have hitherto not been explained. In a recent number of the *Zoologischer Anzeiger* (vol. xv., No. 383, Feb. 1, 1892, pp. 41–43), Mr. C. Verhoeff, of Bonn, Germany, summarizes the results of a series of careful observations which throw a flood of light on the subject. The species observed are *Osmia leucomelæna*, K. and *Stelis minuta*, Nyl.

The species of Osmia construct cells in the interior of hollowed twigs, in the manner of Megachila and similar bees. At the bottom of the cell the female Osmia first puts a layer of pollen, which is to serve as food for the nearly full grown larva. Above this pollen the bee commences to store the cell with prepared bee bread. At this moment the female Stelis watches her opportunity to lay an egg in the Osmia cell, the egg thus being always near the bottom (posterior end) of the food mass. Unaware of the presence of the parasite egg, the Osmia female continues her work, and, after nearly filling the cell, deposits her own egg on the top (anterior end) of the food mass. The cell is then closed with a layer of macerated particles of plants and a second cell prepared above the first. The Stelis larva hatches but little earlier than that of the Osmia, and both larvæ feed on the food mass, the parasite larva at the bottom, the host larva at the top. The latter remains stationary at the top and grows very slowly; the parasite larva grows more rapidly, and gradually works its way upward through the food mass, thus gradually approaching the Osmia larva. The crisis finally comes; the Stelis larva encounters the Osmia larva—a short but deadly combat ensues—the Osmia larva is easily overpowered and killed by the much larger and stronger parasite and its body is devoured by the latter within one or two days.

It is thus evident that Stelis furnishes another illustration of that partial parasitism which I have shown to be the rule with the Meloidæ, but differs in that the parent introduces her egg into the host cell instead of placing it where the triangulin may itself seek and secure its food, or where it may cling to and be carried by the host female into her cell.—*C. V. Riley.*

A SHOEMAKER in Berlin, Germany, has invented an artificial sole of stone for use in shoes. It is elastic and easy on the feet, and is calculated to last for years.



THE FOUR-MASTED SCHOONER JOHN C. FITZPATRICK.

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Fast Torpedo Boats.

A well-ordered and excellently maintained torpedo flotilla, replete in every detail, is absolutely essential to a navy which must be prepared to act offensively. For some time past the continental naval powers of any pretensions have been steadily pursuing a policy of adding to their respective flotillas—both in boats and "catchers" of exceptional speed—while in this country the construction of first-class torpedo boats has remained in abeyance since 1889. Consequently our fleet of torpedo boats is not what it should be. We are lamentably inferior in numbers to those of France, Italy, and Germany, and the few craft of this type attached to our fleet reserves that can lay any claim to be termed fast compare very unfavorably with the modern foreign torpedo boat.

All told, we have only ninety-five boats, and out of these there are only about eight or ten which could be depended upon to maintain a speed of 20 knots, while the persistent building policy pursued by rival European powers has placed them in possession of large numbers, in which the all-essential quality of speed has been the highest aim of their designers. Speeds exceeding 26 knots have been realized on the official trials of several torpedo boats now attached to the fleets of Germany and Italy, and quite recently a torpedo boat, measuring 152·5 ft. in length, with a displacement of 160 tons, was handed over to the Russian government from the works of Herr F. Schichau, Elbing, after having attained on her official trial trip of two hours' duration a mean speed of 26·5 knots. Such a speed as this has never yet been approached in any existing British torpedo boat, the fastest we possess at present being only capable of steaming 23 knots. The new building programme, however, authorizes the construction of ten first-class torpedo boats, which will be added to the navy during the present financial year. From what has transpired in connection with these vessels, we learn that they will have a length of 140 ft. and a breadth of 14·5 ft., and eight of the number are to be equipped with machinery capable of propelling them at a speed of 27 miles per hour. With regard to speed this rate is a creditable step in advance of anything previously aimed at in British torpedo boats, and in virtue of what has been accomplished in vessels constructed for other powers, there is no reason to doubt its realization. Even with the addition of these ten vessels, our strength in numbers will still compare unfavorably with other naval powers of the first rank. It becomes, therefore, necessary for the Admiralty to face this question, and to consider the advisability of adding a certain number of high-speed first-class boats to the British torpedo flotilla every year.—*Industries (London).*

Japanese Dentistry.

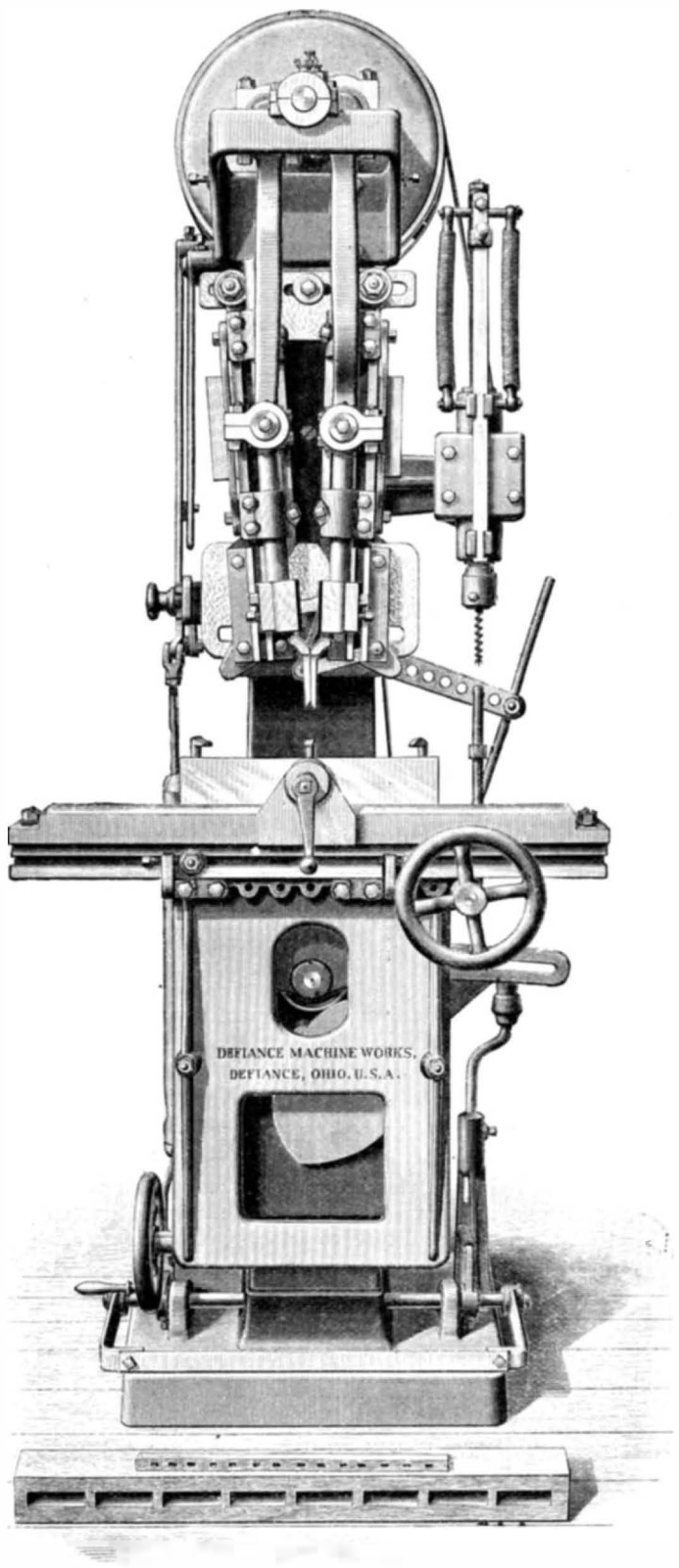
While Mr. Hubbard was minister to Japan, I visited that country and spent a pleasant week with him. One day I was troubled with the toothache, and Mr. Hubbard took me to a dentist and explained to the saddle-colored operator that I wanted the grinder extracted. I was placed in a bamboo chair and tilted slightly back. The dentist examined my teeth, talking volubly meanwhile to Uncle Sam's representative. Suddenly his thumb and forefinger closed on the troublesome tooth, and before I had the faintest idea of what was going to happen, he lifted it out and held it up before me, smiling at the same time that vacant smile peculiar to the children of the Orient. "You were waiting for the forceps, were you?" said Minister Hubbard with a laugh. "They don't use 'em here. Look at this. Here is a young Jap taking his first lesson in dentistry." A twelve year old Japanese boy sat on the floor, having before him a board in which were a number of holes into which pegs had been tightly driven. He was attempting to extract the pegs with his thumb and forefinger. Mr. Hubbard explained that as the strength of this natural pair of forceps developed by practice, the pegs would be driven in tighter. After a couple of years at peg pulling the young dentist would graduate and be able to lift the most refractory molar in the same manner that he now lifted wooden pegs.—*St. Louis Globe-Democrat.*

Better House Heater Needed.

In steam and hot water house heaters there will be a change of fashion soon, if one may judge from what is taking place in the domain of hot air apparatus. It is hardly to be conceived that with all the technical knowledge to be found among the present generation of heating contractors, they will continue to put in house-heating plants having the very poor devices for generating heat that are so almost universally turned out by Eastern makers. The essential elements of a good heater—a good fire pot to develop combustion, large and easily cleaned heating surfaces, together with capacity for different sorts of fuel—are never, to our knowledge, combined in any of the forms now prominently before the public. Until a form of house heater is put out that approximates to the good qualities of a power boiler, the question of the kind to buy will not be settled.—*American Architect.*

A DOUBLE CHISEL MORTISING AND BORING MACHINE.

The automatic double chisel mortising and boring machine shown in the illustration is the first one of its kind ever built, and is to be placed on exhibition at the coming World's Fair as something entirely novel. It is for cutting mortises in either hard or soft wood, from one-eighth to one and a half inches wide and from one-eighth to six inches long, such as required in carriage and wagon, furniture, agricultural and other shops. The driving power is at the top, and the two chisel bars are arranged side by side upon the front of the column. The boring apparatus is in an iron casing, which covers the gears, the auger being in line with the center of the chisels, so that the work has only to be moved laterally from one to the other. The table has a screw clamp to hold the work, the bed on which the table rests being gibbed to the frame and elevated to the chisels by a lifting cam operating on a friction roller. The friction clutch at the top of the machine is connected by foot lever, the weight of the foot upon the lever starting the chisel bars, and the work being gradually lifted until the full depth of cut is reached, when it remains stationary until the mortise is completed, and then descends, the feeding being automatic. The mortises may be made tapering in either direction, or parallel, or tapering at one end and perpendicular to the surface at the other end. This machine is manufactured by the Defiance Machine Works, Defiance, Ohio.



AN IMPROVED WOOD-WORKING MACHINE.

German Vestibule Trains.

Concerning the much talked of vestibule trains now running between Berlin and Cologne, Germany, and to which reference has already been made in the *Railroad Gazette*, the following additional particulars are given in the German papers: Each train is made up of six new cars, having four axles each. One of these cars is a combined mail and baggage car, four of them have each two first-class and four second-class compartments, and the remaining car has five second-class compartments and a porter's compartment. The mail and baggage car is coupled on immediately behind the engine, and is followed by the car with the five second-class compartments. The mail and baggage car is 56·7 ft. long, and the other cars measure 52·85 feet, the weight of the cars ranging between 29,000 and 29,300 kg. (63,800 and 64,900 lb.) each. The cars have side aisles, 1 meter (3·28 ft). wide, and covered connecting platforms, so that one can readily pass from one end of a train to the other. Each first-class compartment has four numbered chairs, while each second-class compartment has six numbered seats arranged in the manner usual on German roads. The first-class compartments also have each a movable table, and bracket tables hung under the window sills. All the tables are covered with green cloth.

The porter's compartment is fitted up with cooking utensils, closets for supplies, etc., a refrigerator, tables, and other necessaries. Gas stoves are used for cooking. Each car has also a water closet and lavatory. Soap and towels can be obtained from the porter for a small consideration. The aisles and small ante-rooms contain collapsible chairs. Bottles containing drinking water and glasses are conveniently disposed. The cars are heated by steam and lighted by gas, and have electric call bells for the convenience of the passengers. Food of good quality and in some variety can be obtained from the porter at moderate prices. Extra seat tickets must be secured by the passengers in addition to the regular trip tickets, the extra charge being one mark (about 25 cents). These seat tickets can be obtained in advance only at the two terminals, Berlin and Cologne. The advance sale of these tickets is closed half an hour before the starting time. Thus, after many years, the American car system is beginning to take root in Europe. In the course of a half century or so it will be further extended.

"Advice" to a Boy.

In one of the large railroad offices in this country is a comparatively young man, who is at the head of a large department. When he entered the service of the company, five years ago, he was green and awkward. He was given the poorest paid work in the department. The very first day of his employment by the company, a man who had been at work in the same room for six years approached him and gave him a little advice. "Young fellow, I want to put a few words in your ear that will help you. This company is a soulless corporation, that regards its employes as so many machines. It makes no difference how hard you work, or how well. So you want to do just as little as possible and retain your job. That's my advice. This is a slave pen, and the man who works overtime or does any specially fine work wastes his strength. Don't you do it." The young man thought over the "advice," and after a quiet little struggle with himself he decided to do the best and the most he knew how, whether he received any more pay from the company or not. At the end of a year the company raised his wages and advanced him to a more responsible position. In three years he was getting a third more salary than when he begun, and in five years he was head clerk in the department; and the man who had condescended to give the greenhorn "advice" was working under him at the same figure that represented his salary eleven years before. This is not a story of a goody-goody little boy who died early, but of a live young man who exists in flesh and blood to-day, and is ready to give "advice" to other young men just beginning to work their way into business. And here it is: "Whatsoever thy hand findeth to do, do it with thy might."—*Youth's Companion.*

Great Chicago to Have the Greatest Telescope.

By the munificence of Charles T. Yerkes, President of the North and West Chicago Street Railroads, the University of Chicago is to have a gigantic telescope. His instructions are to secure the largest and best telescope in the world, regardless of expense, and send the bill to him. This involves a donation of not less than half a million dollars, and will procure an instrument with a forty-five inch lens. The famous Lick lens is nine inches smaller in diameter.

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The Chicago World's Fair.

The following interesting description of the present status of the Columbian Exposition shows what Englishmen think of the great enterprise:

The London *Times* correspondent at Chicago describes the exhibition buildings and grounds as in a promising condition. With few exceptions the great buildings are practically completed, the whole aspect of the Fair showing a state of preparation much further advanced than one would have supposed possible so far ahead of the opening day, which is yet seven months off—May 1, 1893. No room is left for doubt that everything will be ready, in buildings and grounds, by the opening day, and all danger of non-readiness is passed. Thousands of people go every day to the grounds and watch with interest the progress of the work. On fine Sundays as many as 15,000 have entered the gates. They pay a shilling apiece, and this source has already brought in more than £20,000.

The United States battleship, which has been built up from the bottom of the lake behind a protecting breakwater at the upper pier, is practically finished, and looks lifelike from all along the lake front, its turrets, stacks, and towers rising above the deck, and long guns pointing over bow and stern. Here will be made the government naval display. Almost alongside stands the solid-looking "Victoria House" of the British section, occupying an admirable place in the foreground of the Exposition, overlooking the lake, whose waters reach within a few feet of its doors. The first story is up and building progress is rapid. It is an English half-timber house of the sixteenth century, yellow terra cotta being largely used in the lower story, with red brick facing, and mullioned windows. The upper portion will be of half-timber construction, with overhanging and projecting gables. The building being in full view from all sides, each facade is treated architecturally. The plan forms three sides of a quadrangle, with the open side next the lake, inclosed by a raised terrace with balustrade. The interior will furnish offices for the British section, and the principal rooms will be fitted up with wall paneling and elaborate ceilings, like some of the best English country houses. Germany and Russia will also have old-fashioned houses.

The plan of the Fair embraces no fewer than 150 buildings of various capacities. Many of these are specially erected by States of the Union, or foreign countries or for private exhibits, the cost being defrayed outside of the general fund of the Exhibition. The following list of the chief buildings gives the dimensions of each, in feet, with the approximate area of floor and gallery space for exhibitors in acres, and also the cost of each:

Buildings.	Dimensions.	Space.	Cost.
Administration	262 × 262	4·5	£87,300
Manufactures	1,687 × 787	44	320,150
Machinery	842 × 494	17	210,150
Machinery Annex	551 × 490	6·2	
Machinery, machines and boilery	1,103 × 86	2·2	15,000
Agricultural	800 × 500	15	138,300
Agricultural Annex	550 × 312	4	
Electricity	690 × 345	9·3	82,700
Mining	700 × 350	8·5	53,300
Transportation	960 × 256	9·4	73,800
Transportation Annex	850 × 435	8·5	
Horticultural	998 × 251	8	57,400
Fisheries	361 × 162	1·4	44,950
Fisheries, two annexes	135 diameter	0·7	
Fine Arts	500 × 320	4·6	134,100
Fine Arts, two annexes	220 × 136	1·4	
Women's	398 × 199	3·3	27,600
United States	421 × 351	5·5	80,000
United States Battleship	348 × 69	6	20,000
Illinois	450 × 160	5	50,000
Forestry	528 × 208	2·6	18,050
Railway station	300 × 150	4	45,000
Railway station train shed	672 × 150		
Dairy	200 × 94	0·8	6,000
Leather	625 × 150	4·3	20,000
Live stock	440 × 260	2·5	14,000
Saw mill	300 × 186	1	10,000
Music hall	246 × 140	0·7	60,000
Casino	246 × 140	0·7	
Colonnade	600 × 60	0·9	
Pier	2,500 × 250	11·5	25,000

The total estimated cost is thus £1,592,800. Including live stock sheds, etc., there will be a grand total of over 232 acres of exhibition space and other accommodation for visitors.

Besides the buildings above mentioned, twenty-four of the States of the American Union (Illinois leading) are constructing special State buildings, of which seventeen are approaching completion and eight others are in process of erection. Buildings are also contemplated by the Pennsylvania Railroad and the White Star Steamship Line. There will be a Merchant Tailors' Building, a Children's Building, a Workingmen's Home, a building for *Puck*, an Indian School, Pump House and Oil House (both for exhibits), Cold Storage House, photographic building, extensive greenhouses, and sundry other structures, not large in themselves, but all of them in the aggregate covering about 60 acres and costing about £350,000. The United States, besides its large building and the naval exhibit on the battleship, is arranging for other smaller structures exhibiting a lighthouse, life saving station, weather bureau, and heliograph.

The respective buildings are attractive as well as colossal, and of themselves make a most noble display. In the aggregate they are estimated as taking 75,000,000 ft. of timber in construction, representing ten square miles of forests, and also 20,000 tons of structural iron and steel. They are all of them covered with the composition of plaster, cement, and hemp, or similar fiber, known as "staff." The amount of this work upon them is equal to covering the wall of a four story building 15 miles long. The sculpture and decorations on the buildings are also chiefly of "staff," being first modeled in clay. There are altogether on the grounds and buildings forty-eight sculptured groups, and 103 other figures, all of heroic size. The chief statue is the "Republic," 60 feet high, and standing on a pedestal 40 feet high, at the entrance to the Basin, costing £5,000. The buildings and grounds are to be lighted by 5,000 electrical arc lights and 93,000 incandescent lights, there being 17,000 horse power provided for electric lighting out of the 24,000 horse power in the machinery building. This is ten times the electric lighting power provided at the last Paris Exposition, the whole electrical plant costing £200,000. Thus the Fair in all its departments is on the grand scale upon which the ambitious city of Chicago delights in doing everything.

The financial state of the enterprise is also satisfactory. The receipts so far, including paid up stock, £1,018,683, and Chicago's gift, £1,000,000, have amounted to £2,080,209, and the expenditure to about £1,980,000. The treasurer expects additional resources from stock installment payments, bonds, and the gift of Congress of $2,500,000 in souvenir silver half dollars, which are to be sold, excepting some special coins, at double value, $1 apiece. The bonds to be issued are $4,000,000 sixes, which will chiefly be taken by the Chicago banks. All the receipts, property, and salvage of the Exposition are pledged for these bonds, and they are the only lien. The following is the total approximate balance sheet of the Exposition, present and prospective:

RECEIPTS.

Paid upon capital stock	£1,100,000
Chicago bonds	1,000,000
United States half dollars	500,000
United States premiums thereon	500,000
Debenture bonds	800,000
	£3,900,000
Estimated gate receipts (admission 2s.)	2,000,000
Concessions and privileges	700,000
Salvage	300,000
Total receipts	£6,900,000

EXPENDITURE.

Construction and all other preparatory expenses	£3,750,000
Operating expenses	500,000
	£4,250,000
Surplus	£2,650,000

The aggregate investment in the Chicago World's Fair, without counting the individual expenditures of the exhibitors in preparing the display, is the following:

The Exposition Company	£4,000,000
The United States exhibit	280,000
The various States of the Union	1,320,000
Foreign nations	1,650,000
Total cost of the World's Fair	£7,250,000

The foreign interest taken in the fair is more universal than ever known in a previous exposition. The following list gives the nations and colonies participating, the amount of their appropriations, and the expenditures in addition to the appropriations that will be made:

Country.	Appropriation.	Additional.
Argentine Republic	£20,000	
Austria	20,460	£40,000
Belgium	11,400	10,000
Bolivia	6,000	
Brazil	120,000	
Colombia	20,000	
Costa Rica	30,000	
Denmark	13,400	10,000
Danish West Indies	240	
Ecuador	25,000	
France	146,680	100,000
Germany	160,000	100,000
Great Britain	58,200	20,000
Barbados	1,168	
British Guiana	5,000	
British Honduras	1,500	
Canada	20,000	20,000
Cape Colony	10,000	
Ceylon	13,120	10,000
India	6,000	75,000
Jamaica	4,867	
Leeward Islands	1,200	
New South Wales	48,665	
New Zealand	5,500	
Trinidad	3,000	
Greece	12,000	
Guatemala	40,000	
Hawaii	8,000	5,000
Honduras	4,000	
Hayti	5,000	
Japan	126,000	50,000
Liberia	1,400	
Mexico	10,000	
Morocco	30,000	
Netherlands	20,000	
Dutch Guiana	2,000	
Dutch West Indies	1,000	
Nicaragua	6,200	
Norway	11,256	10,000
Orange Free State	1,500	
Paraguay	20,000	
Peru	28,000	
Russia	9,264	50,000
Salvador	2,500	
San Domingo	5,000	
Spain	2,800	
Cuba	5,000	
Sweden	21,600	
Uruguay	4,800	

The following is the allotment of space in square feet to the leading countries:

Country.	Space.	Country.	Space.
Austria	150,000	Japan	60,000
Belgium	120,000	Mexico	61,000
Denmark	20,000	Greece	10,000
France	250,000	Russia	100,000
Germany	250,000	Sweden	40,000
Great Britain	250,000	Norway	50,000
British Colonies	100,000	Italy	45,000
Canada	70,000	Spain	30,000

This makes about 1,600,000 square feet allotted to the leading foreign nations in the various buildings, besides extensive assignments of space on the grounds, where several are constructing buildings. The applications for space in the various departments are much larger than the available room, vast as it is. In the manufactures building there are applications for three times the space, and in several others for twice as much as the respective buildings contain. These countries will have buildings of their own: Great Britain, France, Germany, Russia, Italy, Austria, Canada, Ceylon, China, Colombia, Costa Rica, Ecuador, Guatemala, Hayti, Japan, Nicaragua, Norway, Sweden, and Turkey—19 in all. This is the first exposition that will have had exhibits from every colony of England and France. Concessions have been granted for the purpose of conducting theaters, shops, restaurants, and representations of native life to the following governments: Algeria, Austria, China, India, Dahomey, Egypt, Hungary, Pacific Islands, Italy, Japan, Morocco, Persia, Sandwich Islands, and Tunis.

The ruling power at the Fair is now President Harlow N. Higginbotham and the council of administration of four persons. It was found best thus to concentrate authority, and these gentlemen, with Director-General Davis and his staff of department chiefs, have accomplished the great results herein detailed, and are now making ready for the installation of exhibits. The Fair is working as a harmonious machine, and hence the speedy accomplishment of wonderful results; and this may be expected to continue until the close of the vast enterprise. Mr. Higginbotham is the active partner in the great Chicago dry goods house of Marshall Field & Co., the most extensive "store" in America, and his business accomplishments and activity find a fine field in the Fair.

That a large number of visitors is expected is shown by the "nerve" of the man who has been awarded the "peanut concession." This bold individual pays £28,000 for the privilege of selling peanuts at the Fair. He pledges to pay the Fair 70 per cent of all gross receipts, no matter what he takes in, and this sum is not to be under £28,000. The European tide of travel to the Fair, judging from the inquiries made, will be large. The ease and quickness of a visit from England, through the celerity of modern steamship and railway travel, are shown by a recent case. A gentleman left Liverpool August 6 on the steamer City of New York, and, arriving, went to Chicago, spending two days there. He then came back to the seaboard and returned to England in the City of New York, sailing August 17, and arriving at Liverpool on the 23d, being about only 17½ days. This shows what may be done if pressed for time. This very active and enterprising city of Chicago is certainly preparing for the delectation of visitors from home or abroad what the late P. T. Barnum would have called "the biggest show on earth," and she will make it in all probability the crowning event of the coming year.

At the World's Fair it is intended to institute a grand tournament in all branches of sport, open to all nations for the championship of the world. The money will be provided by the authorities controlling the World's Fair, and a movement is on foot to get the athletes of England, Ireland, Scotland, and Wales to compete for championship honors. Among those who support the idea are the Duke of Fife, the Marquis of Lansdowne, the Marquis of Ripon, the Earl of Rosebery, Earl Spencer, the Earl of Derby, the Earl of Jersey, the Earl of Hopetoun, Lord Brassey, Lord Carrington, Lord Wenlock, Lord Harris, Lord Playfair, Lord Reay, the Bishop of London, Mr. A. J. Balfour, Mr. Chaplin, Sir R. Webster, Sir C. Dilke, Sir F. Leighton, Sir E. Grey, Mr. Froude, Professor Goldwin Smith, the Rev. Dr. Welldon, Mr. Quintin Hogg, and many others.

The matron of Chelsea Infirmary, Cale Street, S. W., with a view to rendering the exhibits in connection with nursing as complete as possible, invites the heads of all hospital and infirmary training schools for nurses, whose standard of training is not less than three years, to send, before December 1, a copy of the certificate they issue, and lend any badge or medal peculiar to their institution, or which may have been obtained for any special service rendered to the cause of nursing.

THE highest railroad in the United States is the Colorado Midland, at the Continental Divide—11,530 feet above the sea level.

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ENGINEERING WORKS, PRESENT AND FUTURE, IN THE CITY OF NEW YORK.

The city of New York, the metropolis of the United States, is every year increasing in importance as the terminal of the great commercial arteries of the country. Her great growth in population and the development of her suburbs has been but one step in her progress; for she not only has to give homes to her population proper, she has also to act as a great receiving and distributing center. From the entire area of the United States the products of farm, orchard and plantation are poured into her lap. These she distributes to the old world. America now is the granary of the world, as Sicily was once the granary of Rome.

From the eastern hemisphere vast cargoes of imports of every description are unloaded at her quays. These have in turn to be sent north, south and west, over thousands of miles of railroads and internal water routes to every State in the Union.

Our engravings are designed to illustrate the great engineering works existing and projected in and about the city. A population of nearly three millions clusters about Manhattan Island. In New York proper there are nearly two millions to be provided for. Our maps shows the city proper in its relation to the surrounding territory. On the map the bridges and tunnels across the Hudson River, the Harlem River and the East River are shown. The enlargement of the Harlem River so as to form a great ship canal at the back of Manhattan Island is also indicated. Crossing the Harlem River and running through the city to Central Park, the course of the two Croton aqueducts can be traced. The ferry lines plying across the two rivers, the Hudson and East Rivers, are also to be noted. In the East River, Hell Gate, once famous as the scene of many accidents to shipping, has now been cleared of so many rocks as to be a safe waterway for all craft.

The water supply has been one of the great problems to be dealt with. The columns of this paper have described in detail the improvements in the water supply. The various dams and the new aqueduct are familiar to our readers. To present a summary of the work in prospect, we give a small map of the Croton watershed. The black portions extend to the outlines of the future reservoir capacity of the city. This will be given by the new Cornell dam. In the midst of the black a shaded area is shown. This is the present Croton Lake. Its area, it will be seen, is but a small proportion of that of the new reservoir. The drainage area of the surrounding watershed is shown in part shaded. This is the portion tributary to the present upper reservoirs. The additional area utilized by the Cornell site dam is shown in white. It will be seen at a glance how vastly increased is the reservoir capacity soon to be called on for the metropolitan supply. The present Croton Lake has a capacity of two thousand millions of gallons; the capacity of the new lake is put at fifteen times this figure. The watershed will be 332 square miles.

The new dam itself is shown in elevation with its spillway. Its size is forcibly brought out by the view of the sections of the Sodom dam, now in operation, and of the proposed Cornell site dam. The great structure is to be 229 feet in height from foundation to crest. The foundation is to extend 70 feet below the river bed. The crest is to be 1,736 feet long. For the water from the spillway a new channel is to be made in the rock, to replace the old river bed. For fuller details the SCIENTIFIC AMERICAN of June 20, 1891, may be consulted.

The next illustration is a bird's eye view of the railroad system of the city, and the bridges and tunnels to be tributary thereto. Reference numbers have been introduced to facilitate the understanding of the cut. The bridges may first be considered. Far in the distance is seen the East River bridge (marked Fig. 1), by whose graceful suspension span Brooklyn and New York have so long been united. A cable road carries passengers from terminal to terminal, and at each end connections with the elevated road systems of both cities are provided.

Some miles to the north of this is the locality for the proposed New York and Long Island bridge, marked Fig. 2. This is situated on a line starting between Sixty-seventh and Sixty-eighth Streets and running across Blackwell's Island to Long Island. It is to be a trussed suspension bridge, and is to carry trains from the Long Island Railroad, with its many divisions, into New York. Running up Sixty-seventh Street, the approach bends to the north and connects with the tracks running from the Grand Central depot. Fig. 3 shows the Hunter's Point or eastern terminal of its Long Island approach.

Fig. 4 shows the present Grand Central station. This is the terminus of the New York Central, the Harlem and the New Haven roads. The tunnel and cutting through which the four tracks run to the Harlem River is shown also.

The Hudson River is the next point of interest. Two bridges are proposed for it.

Fig. 5 shows the terminus of the great North River bridge, which is to be the greatest bridge of the world. It will connect the two States of New Jersey and New York. This has already been elaborately illustrated by us. (See SCIENTIFIC AMERICAN, May 23, 1891.) It is to be of steel, with an extreme length of nearly 7,000 feet. The central span alone, from center to center of piers, is to be 3,100 feet long—about twice the span of the East River bridge. It is to be situated about in line with Twenty-third Street. It is designed to accommodate ultimately fourteen railroad tracks, some for through service, others for rapid transit trains. It is to have connections with the different lines from the West, and is expected to do much local business, incident to the development of the territory north of its New Jersey terminal.

Fig. 6 is the New York and New Jersey bridge. In our SUPPLEMENT, No. 877, some of the details of this great enterprise were given. This bridge is designed primarily for through traffic and passenger business. It is to be of cantilever type. It is believed that four tracks will be enough to accommodate the traffic. It is to cross the Hudson River in line with Seventy-first Street. The New York approach includes two lines. The southern approach runs to a union station at Forty-second Street and Broadway. This station is shown in Fig. 7. It is proposed to cover two city blocks, giving a plan area of nearly four acres. The buildings were designed by Messrs. Creighton Withers and Ernest R. Tilton, of New York, according to a general plan of arrangement submitted to them by Mr. T. C. Clarke, chief engineer of the company. The northern approach is carried in a curve, running under the southern approach, and under the main approach as shown, and thence following the Hudson River shore to the mainland. Here connections for the Eastern States may be made. The object of thus curving the line of the approach is to avoid Riverside Park.

Fig. 8 shows the present terminus of the West Shore Railroad. In the near future this road, now run by the New York Central, is to be a more important factor in the development of the city than it has hitherto been. It opens up the beautiful region back of the Palisades, and to it the western slopes of the great trap rock ridge are tributary.

There are also tunnels proposed, and one in process of construction, for crossing the rivers. The East River tunnel is shown at Figs. 9, 9. It is to start well back from the Long Island shore and crossing the East River at Forty-second Street goes under the city, following the line of Forty-second Street, at a depth varying from 95 to 118 feet, connecting with the Grand Central depot. In the future it is proposed to continue it across the city and perhaps under the Hudson River. At the Grand Central station, and at other points if required, stations with elevators will be located. The total length is about 17,000 feet. Mr. O. W. Barnes, of this city, is the engineer. In our SUPPLEMENT, No. 755, a description, with illustrations, of the work was given.

Fig. 10, 10 shows the line of the Hudson River tunnel, now partly completed. This is to extend between New York and Hoboken. It crosses the Hudson River nearly in a line with Leroy Street. It is to have its main New York entrance probably at Fourteenth Street, near Sixth Avenue, although much of this part has not been definitely decided on. This tunnel has been very fully described in several issues both of the SCIENTIFIC AMERICAN and SUPPLEMENT.

On the right hand of this view and far in the distance the New Jersey approaches and connections with the roads to the West and South can be seen.

This view presents a wonderful summary of the present and future of New York. It should be filled in in the reader's imagination with elevated roads, surface cable roads and other means of internal transit.

As an example of the last line of work we present a view of the One Hundred and Fifty-fifth St. viaduct and Seventh Avenue bridge. This viaduct runs from the high ridge of ground to the west of Ninth Avenue to the southern terminal of the new Seventh Avenue bridge. This viaduct has already been illustrated in our columns (see SCIENTIFIC AMERICAN, June 21, 1890). It will form a most striking addition to the metropolitan features. Its connection with the bridge is seen in the distance.

Space will not permit a fuller description of the matters thus briefly treated. The story is well told by the illustrations.

PROFESSOR WILLIAM R. BROOKS, director of the Smith Observatory, Geneva, N. Y., has just been awarded from the Lick Observatory the prize medal of the Astronomical Society of the Pacific, for his discovery of the new comet on August 28, 1892. Two years ago he also won the first medal ever awarded by the above society.

The Brooks comet, for which this latest prize has been bestowed, is in the eastern morning sky. It has grown much brighter since discovery, and will continue to increase in brilliancy until its perihelion passage, at the close of the present year.

Correspondence.

What Keeps the Bicycle Upright?

To the Editor of the Scientific American:

In your issue of date October 29 appears an article by Mr. J. H. McDiannon upon "What Keeps the Bicycle Upright?" While his explanation is ingenious, and doubtless applicable to the rolling hoop, it is, however, unsatisfactory in the matter of bicycling.

At a slow speed the centrifugal force is too slight to have any perceptible effect. Nor can the most dextrous rider maintain an upright position unless in motion, except by a writhing sort of motion of the body. Note this: the track of a bicycle is never absolutely straight, and were the handle bars to exercise no control over the guiding or front wheel, no amount of centrifugal force at the highest speed could maintain an upright position.

At a slow speed the unskilled rider is seen to sway first to one side then to the other, and is taught to turn his wheel toward the side to which he leans. The wheel then becomes upright, and he directs it straight forward until this is again repeated. Increased speed and skill diminish these maneuvers until they become invisible to the eye, but a minute examination of the track in the dust after even the most skilled cyclist reveals them. It is simply a series of rapid applications of a common mechanical law, *i. e.*, the lever. The wheel and rider inclined to fall are the "weight," the momentum is the "power," and the friction of wheel and point of contact with the earth the "fulcrum." Of course dextrous balancing plays a part too. Momentum acts in a straight line, and when the wheel is turned at an angle to this line the rider, being the principal weight, is carried forward and would pass over the upright position and fall upon the opposite side; but, as before said, he directs the wheel straight forward so soon as the upright is attained.

ROBERT A. HATCHER.

New Orleans, October 31, 1892.

Spider Web from the Clouds.

A subscriber living in Gainesville, Fla., sends us for identification a white thread-like substance which he states fell to the earth in large quantities during a rain on September 20. A sample of the material had already been forwarded by another person to the Smithsonian Institution and was thence sent to Dr. George Marx, of the Department of Agriculture, who makes the following report:

"The sample of a white substance which fell in large quantities in Gainesville, Fla., has been handed me by the botanist of this department for examination.

"This very interesting material is without doubt a product of the spinning glands of a spider, or rather thousands of spiders. The chemical reagencies prove it is not a vegetable matter, but animal, and the fact that strands can be dissolved almost infinitely into minute threads, and further, the great length of the strands, hundreds of yards, causes the inference that only a spider could manufacture it.

"The species of this spider is unknown to me, but it is not improbable that it might be a Nephila, a very large orb weaver, which abounds in the southern part of the United States and the West Indies.

"The young spiders of many genera avail themselves of their spinning products to migrate from their birthplace by floating through the air to localities at a great distance. Should rain moisten these weavings, the spider web becomes too heavy to float in the air, and sticking together in great masses, falls from above.

"A similar occurrence was reported to me from Vallicita, Calaveras County, California, November 16, 1891. It has occurred there for the last four years in October and November."

This is the first time this phenomenon has occurred in the South. The web is perfectly white and appears to be a mixture of silk and cotton, but mostly silk.

The Island of Jamaica.

The island of Jamaica was discovered by Columbus upon his second voyage of discovery in 1494. A landing was effected at a place known on the old maps and still known as Oracabassa. Without regard to many changes since then in the occupany of the island, Oracabassa is known to all steamship men as a great banana port.

In 1889 the entire growth of bananas, amounting to two million eight hundred and seventy-nine thousand five hundred and sixty bunches, went to the United States. Of rum manufactured, one million two hundred and sixteen thousand and twelve gallons were shipped to England and thirty-seven thousand four hundred and forty-two gallons to the United States. A railway in Jamaica runs between groves of mangoes, cactus hedges and banana walks, and along streams over which great cocoanut trees lean and pineapple bushes grow, then climbing hills looking upon the beautiful valley below. One wants to be there to realize the beauty of the scenery.—*Confectioners' Journal.*

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RESIDENCE AT BRIDGEPORT, CONN.

The accompanying engraving represents the residence recently erected at Bridgeport, Conn., for Col. Mason. The engraving and the accompanying are taken from a recent issue of the Architect and Builder edition of the SCIENTIFIC AMERICAN:

The residence as now completed is one of the most picturesque, best appointed and most admired of its class in its vicinity. The underpinning is built of local bluestone, rock faced and laid up in black mortar; the superstructure above is of wood, clapboarded and painted colonial yellow, with white trimmings. Roof shingled and finished natural. Dimensions: Front 51, side 74, not including porte-cochere. Height of ceilings: Cellar, 8; first story, 11; second, 10; third, 8·6. The main hall and staircase are the special features. The arch in hall is supported on colonial columns with carved capitals. This hall is trimmed with antique oak, and it has a paneled wainscoting, an open fireplace, with a tiled hearth and mantel, a paneled divan, and a staircase with carved newels, which is lighted effectively with windows of beaded glass in delicate tints. Toilet is conveniently located under staircase. The parlor is trimmed in an elegant manner, with carved casings and cornice, and is finished in ivory white. It contains a fireplace, furnished with tiled hearth and facings, and a mantel of exquisite design. The library is a spacious apartment, and it is trimmed with mahogany and provided with nook, bay window, and a large open fireplace, with a tiled hearth and facings, wrought iron trimmings and mantel. Den is fitted up similarly. Dining room is trimmed with antique oak and it has a paneled wainscoting, ribbed ceiling, and fireplace with colonial mantel. Butler's pantry is trimmed with similar oak, and is furnished with a bowl and shelf of Italian marble, and dressers fitted up complete. Rear hall and kitchen are trimmed and wainscoted with ash and are provided with all the necessary fixtures in the best possible manner. The second floor is trimmed with whitewood, treated in colors, and it contains five bed rooms and bath room complete. Bath room is wainscoted, and it is complete with exposed plumbing. Floors of hard wood. The third floor contains the servants' apartments, with private staircase. Cemented cellar contains laundry, furnace and apartments. Cost about $25,000 complete. Francis H. Kimball, architect, No. 40 Broadway, New York.

Our engravings were made from photographs of the building taken especially for the SCIENTIFIC AMERICAN ARCHITECTS AND BUILDERS EDITION.

A RESIDENCE AT BRIDGEPORT CONN

Plant Lice and Fumigation.

E. E. REXFORD.

Whoever would grow house plants well must wage war diligently against insects. The frequency with which letters are received from amateur floriculturists, who complain of injury done by plant lice, mealy bugs and red spiders, shows that a great many persons do not know how to fight these pests effectively.

Tobacco, in some form, seems to be the best weapon to use against the aphis or green plant louse. Some prefer to use it in smoke. Fumigation is doubtless the most effective method of fighting this enemy, because smoke reaches all parts of the house or room in which plants are kept. An infusion of tobacco has to be applied with a sprinkler or syringe, and many portions of a plant are not reached, and consequently some aphides escape. As they breed with wonderful rapidity, the plants are soon covered again. The principal objection to the use of tobacco as a fumigation is that it leaves a stale, disagreeable odor behind it, which clings to everything for days. This prejudices many against it. I would advise putting the plants in some shed, outside the house.

Plants may be fumigated in a large box with strips of paper pasted over all cracks. One side or part of one side may be hung with hinges, like a door, to admit the plants to be fumigated, or the cover may be lifted. Cut a hole a foot square through the bottom. Set the box on blocks or some other support, so that it will be about eighteen inches from the ground. When you want to use it, make a fire in an iron pot, dampen tobacco stems, and put them on the fire. Live coals are preferable to any other kind of fire, as they last longer. Set the pot under the hole in the box, in such a manner as to force the smoke to enter it. Let the smoke fill the box, and allow the plant to remain in it from ten to fifteen minutes. At the end of that time, the aphides will nearly always be dead. On removing the plant, jar it sharply to dislodge any that may have become stupefied and fallen among the foliage, also sweep off all that have fallen on the surface of the soil, as it frequently happens, when the smoke has lacked intensity, that some of the insects revive. Then syringe the plant well with clear water. In this way it is an easy matter to thoroughly rid a plant of aphides without having the scent of tobacco all through the house.

The fitting up of a fumigating box is a comparatively trifling job, but persons often fail to attend to trifling matters, thereby putting themselves to great inconvenience. If you cannot do the work yourself, coax the boys to do it for you, or hire some man to do it. It will cost but little, and your box, once fitted, is good for years. You will appreciate it, I assure you, when you find what thorough, effective work can be done with it. All plants should be well fumigated before bringing them into the house in the fall. If clean, they can be kept so. But if you bring a few aphides in with them, in a very short time you will find some of your plants half covered with them, as warm rooms are favorable to their rapid increase.

If tobacco tea is used, I would advise dipping the plants into it, to be sure that all parts are reached. Have it the color of weak tea. Put one hand over the soil in the pot, spreading your fingers on each side the stalk of the plant, and dip the top completely in, shaking it about well to make sure that no insect escapes. This plan is much more satisfactory than syringing. Tobacco dust can be sprinkled over plants, after moistening the foliage, but I do not like this method of fighting the aphis, because it gives the plants a dirty look. The best way is to fumigate.—*Amer. Agriculturist.*

The Coloring of Oranges.

According to *Le Progres Medical*, a new industry has sprung up in Paris. It is that of transforming ordinary oranges into blood oranges by injecting into them Biebrich's scarlet, or rocelline, a harmless agent obtained from diazobenzol in a solution of β-naphthol.

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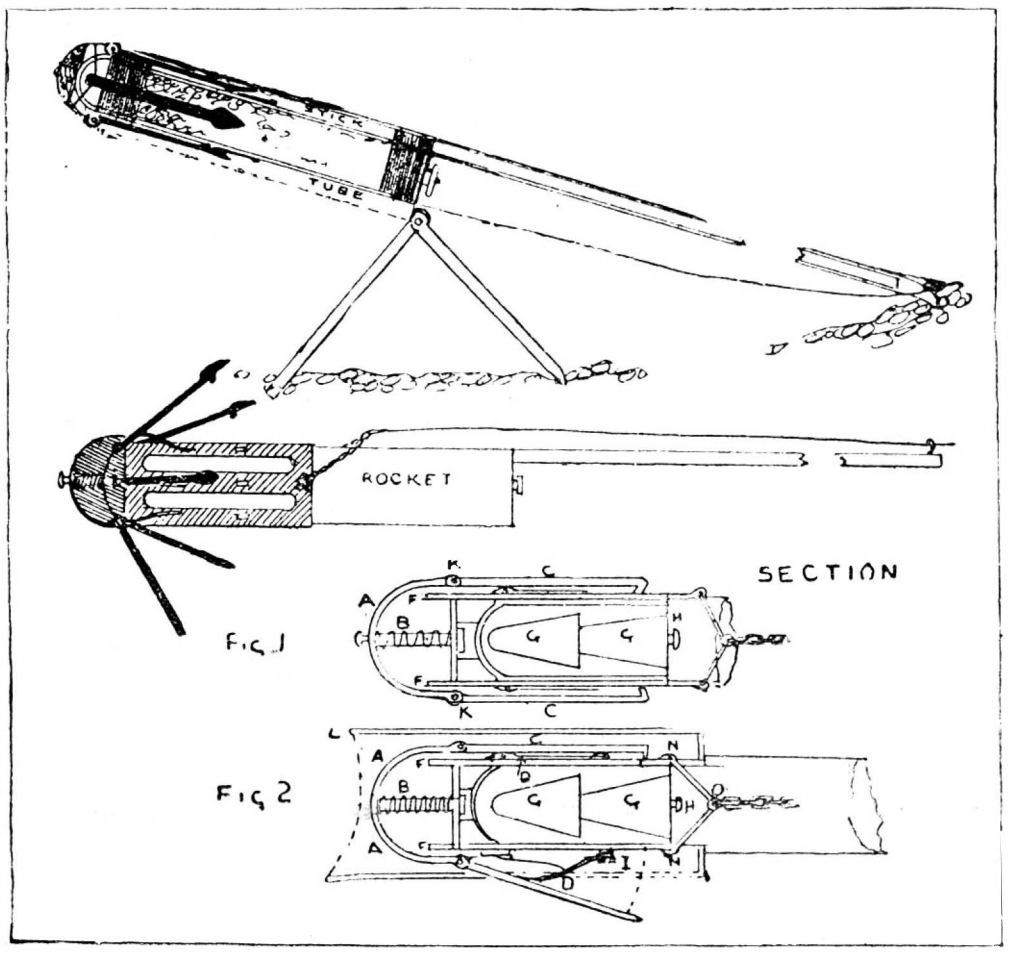
Manufacture of Alum in India.

In a recent issue of the *Indian Engineer* attention is drawn to the manufacture of alum at Kalabagh, on the Indus, at the western end of the Salt Range in the Punjab. The works are owned and superintended by a native khan, and as the expenses are small the profits are very considerable. The process of manufacture is divided into five stages—(*a*) burning the shale; (*b*) extracting the soluble matter from the burnt shale; (*c*) boiling it with salts of soda and potassium; (*d*) crystallizing the impure alum; (*e*) heating in earthen pots and recrystallizing. In the first stage the black alum shales, composed of clay and iron pyrites, are brought by coolies to the works, where they are broken up into lumps about 5 in. square. These lumps and brushwood are placed in alternate layers of about 1 ft. thick, and when the heap is about 15 ft. high it is ignited from below. As the pile burns and sinks down, more layers of brushwood and shale are added. After burning for about six months, the mass is allowed to become cold. The shale has become a bright red color, due to the oxidation of the iron, and is very friable. In the next stage the burnt clay is thrown into square earthen vats about 10 ft. long and 2 ft. deep. Water is then slowly added until its level is nearly up to that of the shale. The soaked portion of the shale is raked down a little at a time into that part of the vat containing the water, with which it is thoroughly mixed; it is afterward taken out with a perforated shovel.

The water containing the soluble part of the burnt shale is, after a time, drawn off into a similar vat, and any red solid suspended matter is allowed to settle. It is afterward drawn off into a shallow circular vat about 10 ft. diameter made of plates of sheet iron riveted together. The solution is then boiled with an impure sodium and potassium salt called *jamsan*, obtained from *reh*—the sodium sulphate and carbonate efflorescence so commonly found in the Punjab. The liquid, after further boiling, is decanted and allowed to crystallize in vats of sun-dried clay. The crystals are about ½ in. diameter, and of a light grayish-green color. These are stacked and allowed to drain for ten days. After this they are put into earthen pots holding about 1½ maunds (112 lb.) with a little water, and are heated in a kiln or oven. The earthen pots are broken open when cool, and large crystals of alum, some 6 in. long, are found inside. This is the form in which it is sold in the bazars. These works produce some 3,000 maunds per annum. From three to four seers of alum (7 to 9 lb.) is about the quantity obtained from each maund (75 lb.) of black shale.

The Height of Rooms.

According to the *Practitioner* for March, the English Local Government Board has addressed a memorandum to the sanitary authorities of England concerning the height of rooms used for habitation, a recent law having conferred upon them authority to regulate this matter. It is held that it is unnecessary to appoint a maximum height, but, as low-pitched rooms are more difficult to ventilate than rooms of greater height, especially sleeping rooms, in which the occupants are not able during sleep to vary the conditions of air movement through the rooms, a minimum height should be established. While a room may have sufficient floor space for a given number of people, whether this number will have enough breathing space to keep them in health will depend upon the height of the room. For example, if there is just enough breathing space when the height is eight feet, it is obvious that there will not be enough when the height is only seven feet. A minimum of nine feet is recommended, and the board will not approve of a smaller height than eight feet over the total area of the room. In a room of irregular height there must be a mean height of eight feet.



LIFE-SAVING ROCKET GRAPNEL.

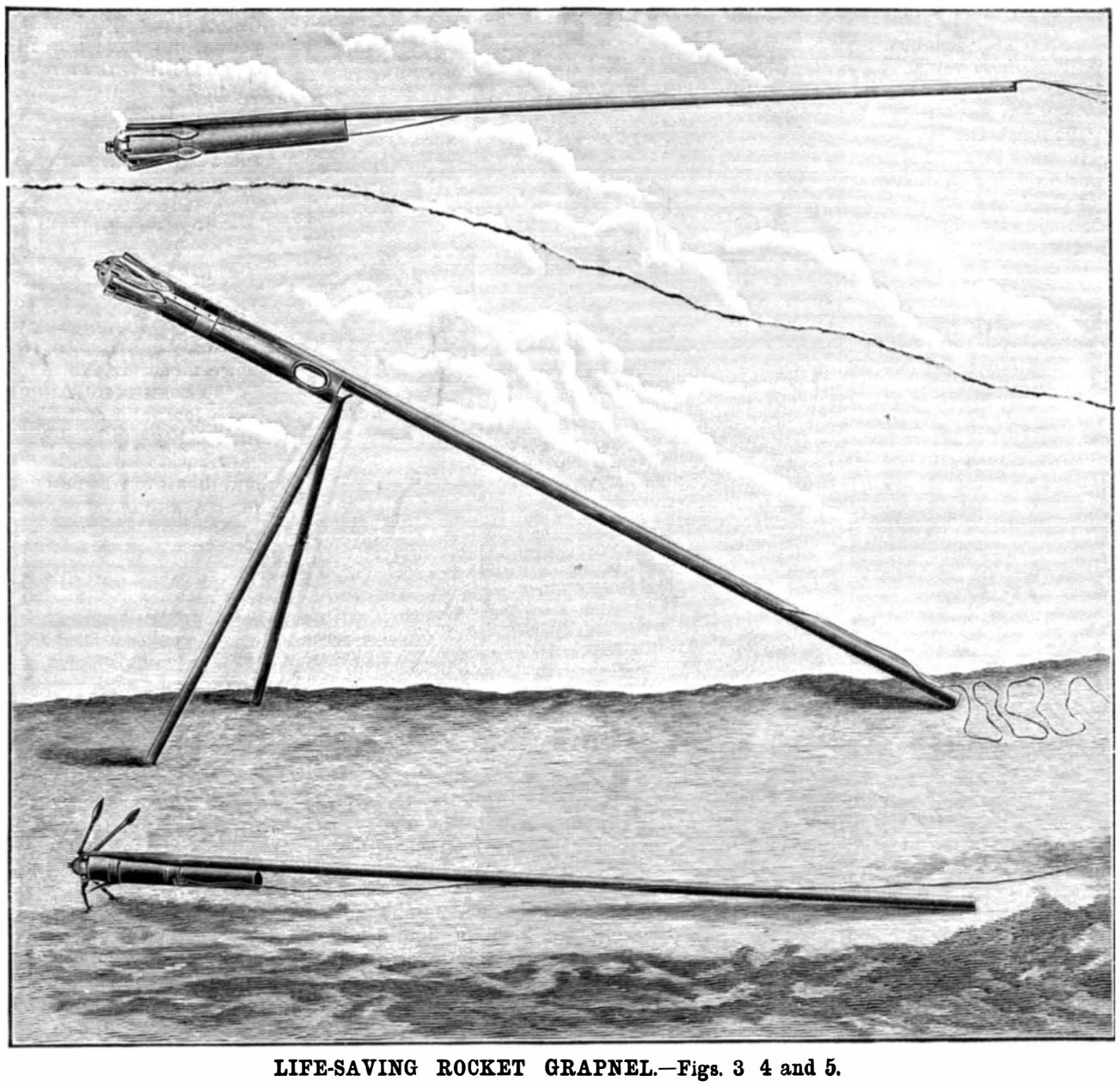
THE LIFE-SAVING ROCKET GRAPNEL.

Several months ago, when the steamship Eider, of the North German Lloyd's, was stranded, the efforts to save her were more or less nullified by the lack of proper appliances for establishing communication between ship and shore. This apparent lack of invention induced the proprietors of the London *Daily Graphic* to offer a prize of $500 to the inventor of the best means of communication between a stranded ship and the shore or a boat.

The responses to this offer were surprising. Within the short period from February 6, 1892, to March 31, 1892, when the competition closed, no less 1,899 projects were sent in, and soon afterward 300 more were presented, making 2,200 in all. Of this large number, all but one hundred came from Great Britain, and of the hundred Germany and Austria furnished the larger share; some came from France, but only a very few from the United States. Many of the plans resembled each other. Those that presented any special features of novelty were published in the *Daily Graphic* and have been reproduced in the SCIENTIFIC AMERICAN SUPPLEMENT. Very many of the plans lacked novelty.

The work of deciding to whom the prize should be awarded was intrusted to a board of judges, consisting of Rear Admiral Seymour, C.B., Captain Vyvyan, R.N.R., Elder Brother of the Trinity House, and Captain Wyatt. The devices submitted formed a wonderful collection of contrivances, embracing buoys, various forms of propelled boats, kites, balloons, guns, rockets, mortars, rafts, trained birds and dogs to carry lines, cranes, bridges. life boats, parachutes, harpoons, anchors, oil spreaders, aerial machines, electrical appliances, etc. Those who wish to know more particularly about these various devices will do well to consult the engravings of them given in the SCIENTIFIC AMERICAN SUPPLEMENT.

The judges, after long and careful consideration, finally decided to award the prize to Messrs. Thompson and Noble, of Southampton, for their rocket grapnel and line, of which we herewith present engravings. The diagrams, Figs. 1 and 2, show how the device is used. The upper sketch represents the grapnel and rocket in position ready for firing. The second represents the rocket after being fired, the grapnel having opened out as soon as the ground was touched. The two lower figures show sections Fig. 1 of the grapnel and Fig. 2 of the grapnel fixed on the rocket tube. A is the head of the cap or grapnel; B, the spring to relieve the arms when required; C, arms of grapnel; F, bolts from head to tube for spring; D, side springs to push out arms when required to grip. L is the tube which passes over the rocket and forms the shell of the entire grapnel; G, charge in the rocket; H, fuse; I, the slot for keeping the arms in position before firing; K, hinges and stops for arms of grapnel. N is the connection wire to swivel, O, which is attached to the grapnel tube, and conducted by the wire line to the rocket line at the end of the



LIFE-SAVING ROCKET GRAPNEL.—Figs. 3 4 and 5.

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stick, which always holds good when the rocket line gets burned next to the rocket.

Fig. 3 is another view showing the apparatus set up ready for firing, Fig. 4 shows the traverse of the rocket through the air, Fig. 5 shows the device after it has struck the ground, Fig. 6 is an enlarged view of the grapnel and attached line.

The judges in their report speak as follows:

"This invention is a grapnel that can be readily and quickly fitted on to the Boxer's Board of Trade life-saving apparatus rocket. The grapnel has arms fitted to it which keep shut closely to its sides during the flight of the rocket, but which, on its touching the ground, open out, and, when the line attached to the rocket is hauled on, grip the earth, and so secure the line to the shore. This invention provides for the use of either a single line or of a block and double line rove through it, according to distance and circumstances. We have seen the above rocket grapnel tried more than once. We think it a very great advantage that these grapnels can be fitted to the present Board of Trade rocket, for five reasons. First, these rockets are well tried, known, and approved. Second, there is already a large stock of them. Third, the plant for making them is in existence. Fourth, the same may be said of the troughs for firing them. Fifth, the line used with them has been well tested in all ways.

"We do not think finality is yet nearly reached, and we believe that a rocket and grapnel, both lighter and more satisfactory, would be evolved in the course of properly conducted experiments. We think that the Board of Trade rocket line is capable of reduction both in size and weight; thereby adding to the length of range, without too much reducing the required strength. Before concluding our report, we desire, in the interests of seamen generally, to record our opinion that circumstances often arise when a light shoulder line-throwing gun, such as those devised by Messrs. Dawson, of Dundee, and Commander J. D'Arcy Irvine, R.N., would be invaluable, and often be the means of saving life by rapidly taking a line to a man overboard, or to a boat adrift or in distress, also for communication between two ships at sea in bad weather. By such means one vessel might take another in tow without lowering a boat, or might be enabled to save lives from a sinking ship, when a boat could hardly live."

The report closes with a strong appeal to the government to institute measures looking to the encouragement of new inventions calculated to save life. "We venture to think that this is not too much to ask at the hands of one of the richest nations of the world, and essentially the nation that lives by its sea-borne commerce, by its ships and its sailors, whose mercantile fleet numbers about 15,000 vessels, manned by 204,000 valuable lives, to say nothing of the passengers annually carried under the national flag—a nation the value of whose literally 'floating' capital, or property at sea, on any given day in ships and their cargoes is said to be worth not less than 200 millions sterling—a nation of people who consider themselves as one of the most humane and enlightened in the world."

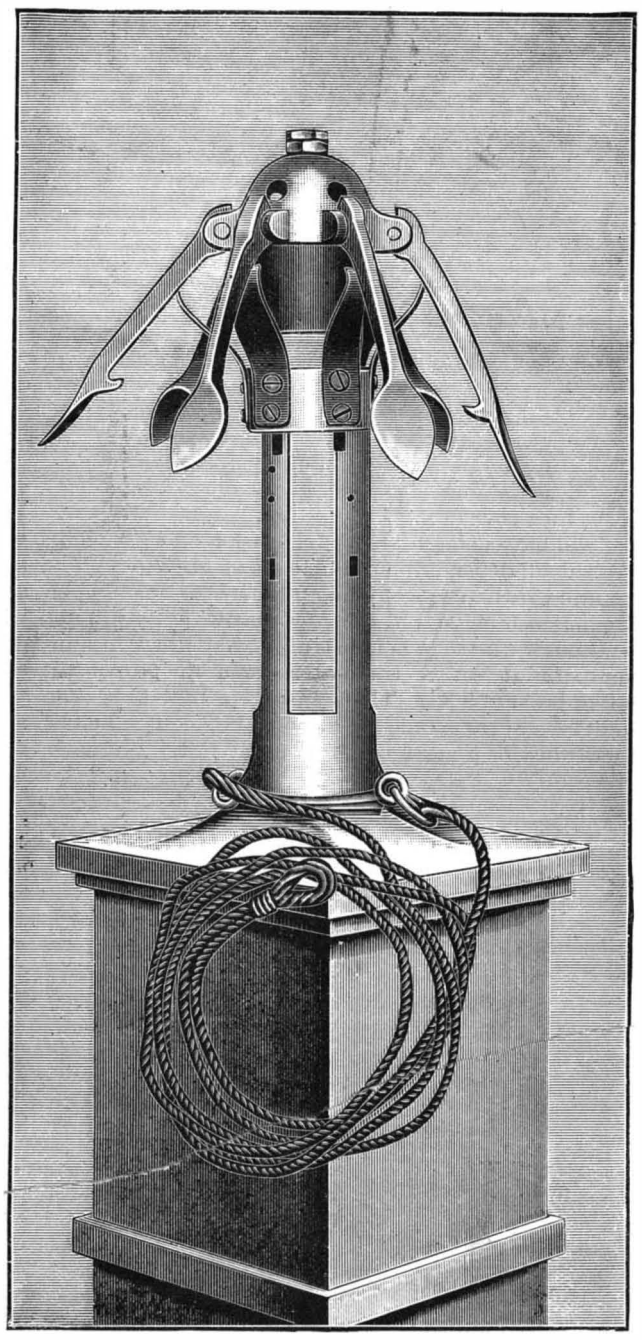

Fig. 6.—LIFE-SAVING ROCKET GRAPNEL.

The Humming Bird's Food.

BY MORRIS GIBBS, M.D.

This article refers to the ruby throat, the only representative of this interesting family in our State. Much has been written regarding the food of this species, and yet I am satisfied that but few accurate notes have been offered to the readers. The writer offers observations taken with a view to learning of the feeding habits, and does not pretend to assert that others' notes, however conflicting, are not correct. Locality has everything to do with the habits of birds, and the requirements of the same species may differ vastly in a slight variation either in latitude or longitude. Again, the resources of a region may radically alter the food habits of any and all animals. Certain it is that my observations convince me, contrary to all writings that I have seen, that the food of the ruby-throated humming bird is mainly honey, and that these little fellows do not rely to any extent on an insect diet.

Years ago I captured several in our flower garden with my insect net, and, in accordance with the views of all books read, they were offered insects as food, but invariably completely ignored everything of this nature set before them. No matter whether I gave them the liberty of a large room or confined the frightened creatures in my hand or a small box, the result was invariably the same; all insect food was refused, whether small beetles or even those minute flies or gnats often common about honey-producing flowers. However, on releasing the captive, it would immediately visit the flowers, and appear to revel in the exploration of the deep recesses of the fuchsias and trumpet creepers. One immature specimen that I caught would sip sugar water from my hand, and even protrude its delicate tongue for the sweets to be so easily had. This young one was so very unsophisticated that it had to be taught regarding the honey water, by dipping its tiny, slender beak into the sticky mass, after which it quickly learned. The old ones only fluttered in my hand, and would not eat, but would apparently enjoy that which was forced into their bills. But, left to themselves and watched secretly, they could be seen indulging in the sweets provided for them. If held carefully and an insect forced between their mandibles, they invariably ejected it with a snap of the bill and a side jerk of the head.

Of the wild flowers of Michigan, there are many species which the hummers visit regularly, but as nearly all of these flowers are so far from my residence, it follows that my observations are mainly made from our house plants and garden flowers. Of all of the uncultivated species that I know, the flowers of the wild crab apple are most sought after by the ruby throat, and during the season, about the middle of May, a hundred birds may be seen in a few hours about a group of these trees. There are very few insects on the crabs, and in wet days none, and yet the hummers swarm about. They must come alone for sweets. One point in relation to my theory of the hummer's love for honey would seem to receive a challenge, and it is that the ruby throat rarely hovers over the common red and white clover. Now, as we know, red clover is one of the sweetest of flowers, and a head is agreeable to any one's palate, while the white clover is a great favorite with the honey bee. My reply to this is that the individual flower is too small for the ruby throat's attention.

On our piazza in the city are a number of house plants, some growing in a hanging box, others in pots on a stand, while several species of outdoor perennials and annuals flourish in a bed just below, and a large creeper clambers near. It is safe to say that from early morning till evening twilight there will be an average of one visit every half hour by the hummers to this collection. So unsuspicious have they become that one can study them at a yard's distance. One advantage in observing them is that they always make their presence known by their pleasant humming and a faint, sharp chirp; thus warning one when to lay aside the book and watch their movements.

On first appearing, they immediately dash toward the fuchsias, which are their greatest attraction, and the next best is the trumpet creeper, and then the selection appears to them indifferent, as the pelargoniums, nasturtiums, morning glories, and others are visited indiscriminately. However, the fuchsias are first choice, and, wondering at their preference, I examined the blossoms thoroughly for insects and sweets. In very few cases, and at rare intervals, I found small insects, as no others can reach the heart of the flower; but in every case I met with a most refreshing nectar—to be sure, in very small quantity to us, but to a hummer a most plentiful supply. Let my readers pluck a full blown fuchsia blossom, and cutting into the calyx near the stem end, apply the part to the tip of the tongue, and they will be fully convinced why the hummer is partial to this beautiful pendent flower.

Thinking to test their fondness for sugar, some was dissolved and then dropped deeply into the blossoms of the creeper. In the course of the hour, in their rounds, the busy birds found the bait, and fully thrice the amount of time was spent on the extra sweetened flowers as was occupied over those of nature's honeying. The sweetening attracted many insects in the course of the day, principally ants and small flies and gnats, but not one instance of their capture could I detect, although careful record of the number of insects in each flower was kept, and the flower examined after each bird departed.

The movements of the hummers when visiting a bed of flowers are interesting. With a dash it is among us with the characteristic impetuosity of its kind, but it is not then detected by the ear, as the noise of a flying bird is, but slight and not always heard. It is when the bright, red-throated fellow stops in mid-air that we hear his rapidly vibrating wings, always loudest when he makes a sudden side movement from flower to flower. Selecting a flower, after a second's inspection of his surroundings, a rush is made toward it at a very rapid rate, but just as we think he will fly past or against the blossom, he stops—stops instantly. In the fraction of a second he introduces his tiny, but long, slim bill into the heart of the flower, and then is away to the next. The swiftness with which this delicate bird travels about, exploring hundreds of flowers each hour of the day, and from early morning till twilight, is truly a marvel.

At each insertion of the tiny beak, his mobile tongue is thrust out and from side to side, and the sweets, and, I think, some pollen, are drawn into its mouth. The tip of the tongue is peculiarly and beautifully constructed for this purpose, and with the perfect adaptability of its slender, delicate bill, the bird is endowed with the means of securing sweets, possessed by no other groups of bird.

In conclusion, I will say that I have carefully dissected many humming birds, both old and young, but have never found anything to convince me that the birds lived on insects. It may be that at times when flowers are scarce some species of insects are captured, but I am satisfied that in season, when flowers are abundant, the ruby throat of Michigan lives on honey.—*Science.*

The Petrified Forest of Arizona.

BY H. C. HOVEY.

For the sake of others, as well as on my own account, it seems desirable to correct certain errors that might be amusing were they not annoying. The only description given by me to the public concerning the petrified forest of Arizona appeared in the SCIENTIFIC AMERICAN for July 23, 1892. Yet a long and sensational report of my visit to the locality has been published in the dailies of New York, Chicago, Kansas City, and elsewhere, and has even been copied in several scientific papers, with blood-curdling details of hairbreadth escapes, and alluring accounts of my finding opals, rubies, and sapphires, in addition to the more common gems, that abound in what is fitly styled the "Chalcedony Park." All this is given in quotation marks, and is emphasized by the solemn statement that the author is a clergyman. Hence the occasion for this formal disclaimer.

I may add that a letter just received from Hanna's ranch refers to this matter and closes as follows: "Since the appearance of your very comprehensive and truthful article in the SCIENTIFIC AMERICAN, we have had many letters from all parts of the United States inquiring as to our wonderful petrified forest. The Atlantic and Pacific Railroad have become so much interested as to put a special station at Whistling Post 233, where you got off from the fast California express to foot it across the plain to our ranch, and we shall hereafter make it a point to meet tourists on arrival and convey them by carriages to the Chalcedony Park. We wish that you would also let it be known that during the summer and fall the streams are entirely dry, so that there need be no fear of such perils as you had to encounter."

IN France hard water has been successfully made soft by means of electricity.

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Measuring the Rise and Fall in Waterways.

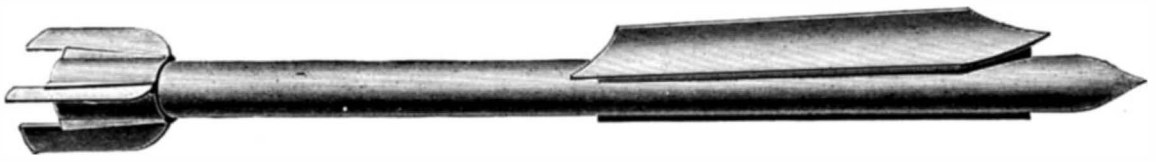
Mr. F. J. Smith describes in *Nature* a unique method of observing the rate at which a river was rising after a fall of rain, as follows: The river was a considerable distance from the spot where its height was to be known. By means of the combination of two organ pipes and a telephonic circuit described in the following lines, I have been able to make the required measurements within rather closer limits. At the river station an organ pipe was fixed vertically in an inverted position, so that the water in the river acted as a stopper to the pipe, and the rise or fall of the water determined the note it gave when blown by a small bellows driven by a very small water wheel. A microphone was attached to the upper end of the organ pipe; this was in circuit with a wire leading to a town station at some distance; at the town station there was an exactly similar organ pipe, which could be lowered into a vessel full of water while it was sounding. By means of a telephone the note given by the pipe at the river was clearly heard at the town station; then the organ pipe at this station was lowered or raised by hand until it gave the same note. The lengths of organ pipe under water at the two stations were then equal, so that the height of the water in the distant river was shown. The determination can be made in less than a minute by any one who can recognize the agreement of two similar notes. The arrangement when first tested was so placed that the height of water at two places near together might be easily compared. I found that a lad with an average ear for musical sounds was able to get the two heights to agree within one-eighth of an inch of each other, while a person with an educated ear adjusted the instrument immediately to almost exact agreement. The total height to be measured was 17 in. A difference of temperature at the two stations would make a small difference in the observed heights. For instance, taking a note caused by 250 vibrations per second, a difference of 10° C. between the temperature of the two stations (one not likely to occur) would make a difference of about 0·02 ft. in height, a quantity of no moment in such a class of measurements. The organ pipes were of square section and made of metal to resist the action of the water.

Hook Swinging in India.

In the SCIENTIFIC AMERICAN of March 5, 1892, we gave engravings of the hook swinging festival as practiced by the heathen at Madura, in India, with a description of the proceedings by the American missionary Rev. J. S. Chandler. We have lately received some additional photographs of the same performances, from Mr. H. C. Van Ingen, artist and photographer, at Coonoor, Nilgiris, S. India. The further practice of this barbarous rite has been prohibited by the government. Mr. Van Ingen, who took the photographs from which our engravings were made, has also sent us some fine photographs of the Indian bison, the domestication of which is now being attempted.

AN AERIAL AND SUB-AQUATIC TORPEDO.

A torpedo designed to be guided in its flight on leaving the gun after the manner of an arrow from the bow, and to continue its course on or near the surface, should it strike the water, is shown in the accompanying pictures. The piece of ordnance for starting the torpedo, shown in Fig. 1, is preferably a breech-loading gun, the torpedo, shown in Fig. 2, being loaded in from the muzzle. Fig. 3 is a cross section through the front part of the projectile, showing the wings on top of the main tube, and below a weighted piece similar to the keel of a boat, while Fig. 4 is a cross section of the rear wings, the latter sliding forward on the body when the projectile is placed in the gun, as represented in the principal view, but slipping back to the rear as the projectile commences its flight. The shape and inclination of the wings are such as is designed to uphold and direct the projectile in a straight course through the air, retaining it also near the surface after it strikes the water, until its propelling power is completely exhausted. In addition to the propelling force supplied by the gun at the time of discharge, in this usual manner, this torpedo is provided with further means of propulsion, concealed within the rear portion of its body, the combination being designed to give the projectile a great range and high speed through either the air or water. A 12 inch torpedo of this construction is adapted to carry 350 pounds of a high explosive. The improvement is the invention of Mr. L. Gathmann, a mechanical engineer of Chicago, who has made a number of tests on Lake Michigan with projectiles up to ten feet in length, and is said to have demonstrated that they will carry several miles with great accuracy of aim.



THE GATHMANN TORPEDO—Fig. 2.

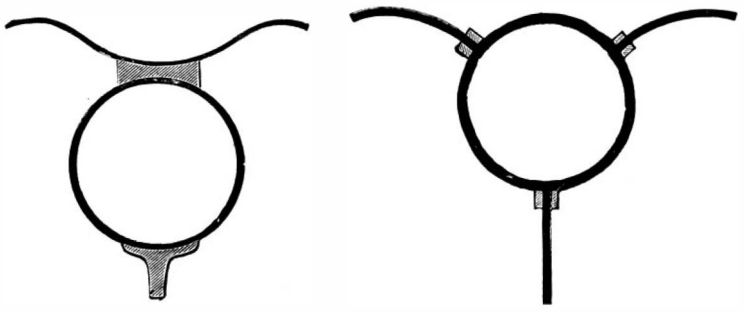


Fig. 3. Fig. 4.

THE GATHMANN TORPEDO—SECTIONAL VIEWS.

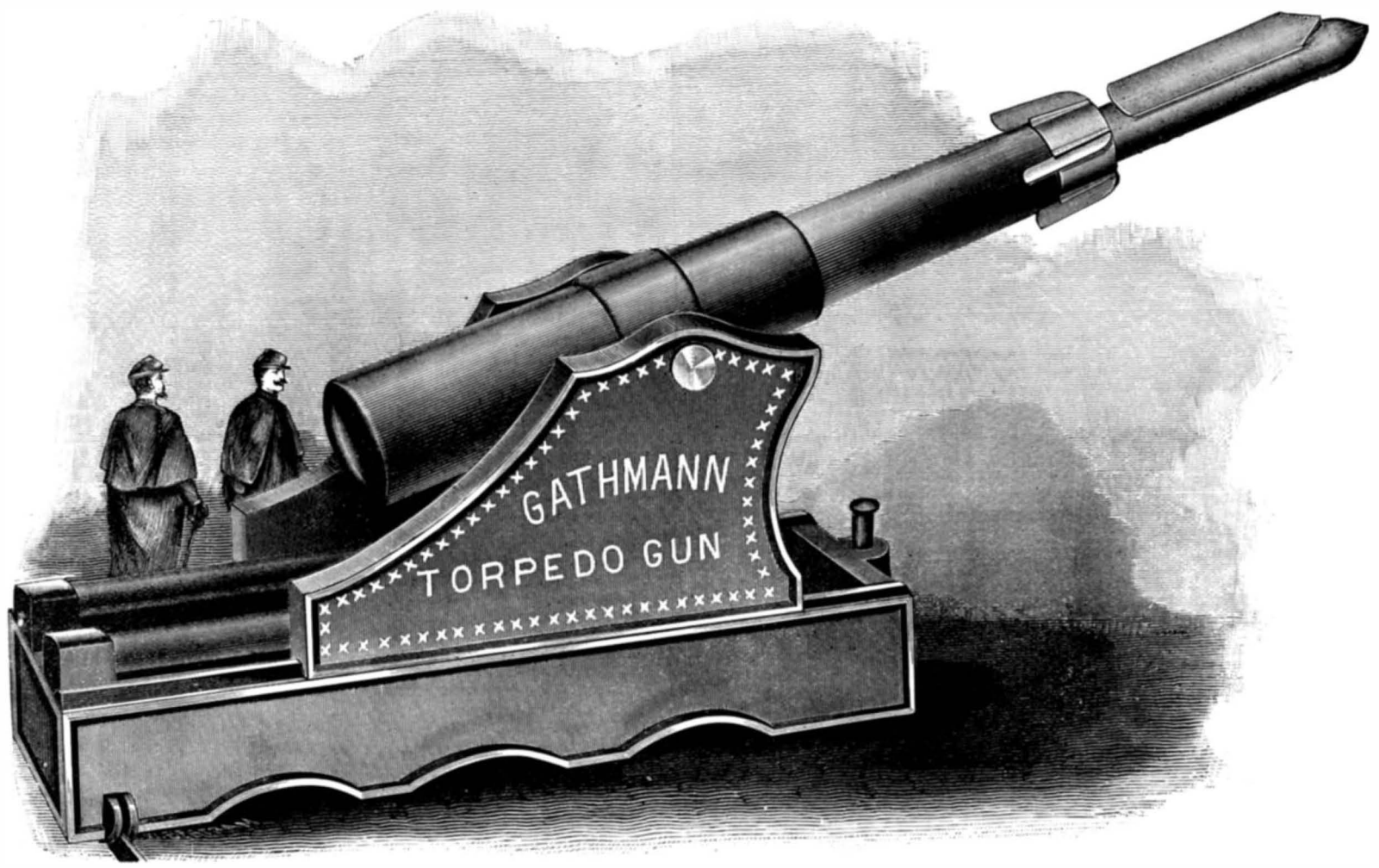
The New Packing House, Kansas City.

The new Armour packing house at Kansas City was started up "for business" on October 1, with between 600 and 700 men at work, which force will be enlarged to between 2,000 and 3,000 when in full operation, and as the old house (Armour Packing Company) employs nearly as many men, the total force in the employ of the Armours in the city will be between 5,000 and 6,000 men.

One of the most interesting features of this plant is the cooling machinery for the two cold storage houses, one 178 × 135 feet and the other 178 × 118 feet, each four stories high, with capacity for 10,000 beeves daily. The refrigerating machinery cost $250,000, and was furnished by the Frick Company, of Waynesboro, Pa. The machines are their single-acting vertical compressors with horizontal engines. The power is furnished by two 150 horse power tandem compound condensing Corliss engines, and each of the two refrigerator machines has a capacity of 200 tons per day. This is sufficient to reduce to the freezing point a space of 4,000,000 cubic feet. Each cooler is supplied individually with large steel ammonia pipes, and the system by which they are connected with the ice machine is such that the full pressure can be turned upon any one cooler if necessary. In case one of the ammonia tanks becomes disabled, by a system of pipes and shut-off valves the pressure can be transferred to the other tank without any loss of cooling power whatever. There are over 200,000 feet of ammonia pipes in the several coolers. The machines were set up under the direction of Thomas Shipley, who had 250 men under his direction for thirty days, the machines and materials used having required 150 cars in their transportation from the works in Pennsylvania to the packing house.—*Ice and Refrigeration.*

How to Get Rid of Mosquitoes.

In a late number of *Insect Life*, Mr. L. O. Howard publishes a note upon the use of kerosene against them, the substance of which is as follows: On the surface of a pool of water, containing about 60 square feet, he poured four ounces of kerosene. This formed a very thin oily film on the surface of the water. On the 5th of July the pool was teeming with animal life, but for the next ten days that the pool was under observation no living insects were observed. At the end of this time, a count of the insects on a small portion of the surface, from which was estimated the total number, showed 7,400—370 of which were mosquitoes. The kerosene remedy was tried this last summer on the swamp meadow pools of Stratford, Conn., with much success.



THE GATHMANN TORPEDO AND TORPEDO GUN—Fig. 1.

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RECENTLY PATENTED INVENTIONS.

Electrical.

ELECTRODE AND INCANDESCENT ELECTRICAL CONDUCTOR.—Lewis L. Jones, Brooklyn, N. Y. Arc light pencils and filmentary conductors for incandescent lights are, by this invention, designed to be formed of a paste composed of a refractory or non-conducting oxide, a metallic or conducting oxide, and a fluid binder consisting of the acid solution of two oxides, one refractory or non-conducting, the other metallic and conducting, then drying the article and subjecting it to a high heat. Or the mixture may be made by stirring together powdered ingredients of refractory earthy substances with metallic conducting substances, or in other ways, it being designed to form a substance which, for either arc or incandescent lighting, will have longer life than the carbons, and give greater intensity and steadiness of light.

Railway Appliances.

SWITCH OPERATING DEVICE.—Benjamin Bartelmes, Brooklyn, N. Y. This invention provides an attachment for a cable railway car to set a platform switch in advance of the car, if the switch has been left open by a car ahead leaving the track. Combined with a forward extension of the car platform is a vibratable weighted arm with a wheel at its outer end, a flexible connection extending from the arm over a pulley and thence to the car platform, the device being adapted for detachable connection with the platform dashboard.

Mechanical.

SHAPER AND CUTTER HEAD.—John J. Quinn, Rochester, N. Y. The shaper head provided by this inventor has its body made up of a series of collars, each of which has a central bore enabling the head to be secured to a mandrel, while the knives have dovetail tongues fitting in keyways in the collars, each keyway being partly in two collars, so that the body portion of the head and the knives are rabbeted together. A sectional head is thus formed which may be easily put together or taken apart, one which will cut effectively, and in which the knives may be quickly and firmly fastened in place. Heads of this class are especially adapted for use in cutting raised panels, mouldings, and similar work.

BUILDERS' SCAFFOLD.—John E. Ennis, Duluth, Minn. Portable scaffolds of great strength and simple construction, and easy to handle, are described in this patent. The main support consists of a shaft formed of a tubular rod, with a collar reversibly mounted near one end, a bracket and clutch mechanism being also mounted on the shaft, the mechanism including reversible clutch members, whereby the mechanism is adapted to move the shaft and the bracket, or be movable on the shaft to raise the bracket. The parts of the device may be systematically assembled, and can be bodily transferred from one floor to the other, the workman and material supporting platforms being raised while the work is going on, to keep the material and the wall at substantially the same levels.

Agricultural.

PLOW.—John P. Couch, Henrietta, Texas. This is a cheap and simple cultivator plow for barring and dirting cotton and other plants, and has a mould board to turn the dirt away from the plant, and a land side extending above and below the mould board to steady the plow and prevent the dirt from falling back upon the plant. A shovel plow is arranged to the rear of the mould board plow to break up the dirt turned back by the latter and immediately throw it back toward the plants, thus avoiding delay and preventing any damage from storm or other circumstances. The auxiliary standard, carrying the shovel plow, may be arranged upon the same side of the beam as the main standard or upon the opposite side.

Miscellaneous.

BICYCLE SADDLE.—Charles Stein, Meadville Pa. The saddle and springs are of the usual construction, and the parallel members of each spring terminate in a yoke, with a threaded bore receiving a screw, one end of which has a right thread and the other a left, while centrally is a wrench head or nut by which the screw may be turned, and the springs be thereby drawn together or forced apart. The seat being connected with the upper members of the springs, the saddle may, by this improvement, be instantly adjusted to bring the seat to the desired inclination or angle in relation to the machine.

FAUCET.—William W. Riner, Los Angeles, Cal. This is a faucet more especially designed for use on sheet metal cans and similar vessels, being easily operated, very effective, and of simple and durable construction. In one side of the bottom of the can is a recess, in the vertical wall of which, inside the can, is the seat, having a tapering bore, of the faucet. The inner end of the spout is tapered to fit the bore, and has a lateral opening corresponding with one in the bore, the openings aligning when the outer end of the spout is turned downward to discharge the contents of the can, but the apertures being disconnected when the end of the spout is turned up in the recess.

LOBSTER SHIPPING APPARATUS.—Arthur McGray, Yarmouth, Canada. A tank with shelves and havin a detachable door, feed pipes at the sides dischargit upon the shelves, exhaust valves opening from the tank, in connection with a pumping apparatus, form the principal features of this improvement, the tank being designed to be carried on a vessel and afford the means of carrying lobsters long distances alive. The device is portable, and can be readily removed from and placed in position on a vessel, or the tanks may be built in the vessel, and the removable door allows for giving the lobsters air without disturbing the pipes or cocks.

PENDENT SET SCREW DRIVER.—David Mendelson, New York City. This invention relates to a tool used for adjusting the setting stem in stem-winding watches, and provides a single tool which may be instantly adjusted to fit a stem and sleeve of any size, so as to be equally useful in adjusting two-slotted and four-slotted stems. The stem of the handle is provided with four spring arms which stand normally apart at their free ends, each arm having a terminal blade adapted to enter a slot in the watch stem sleeve, while a clamping ring slides on the divided stem.

MOTOR.—John C. Lueneburg, Lakefield, Minn. This is a simple and durable motor designed to drive machinery such as is employed for propelling vessels and vehicles. A slide having foot rests is connected with the machinery to be driven, a lever being pivotally connected with the slide, and a frame pivotally connected with the lever, there being handle bars on the frame to be taken hold of by the operator as he presses with his foot on the foot rests on the slide. The sliding motion thus effected by the feet and hands is by proper gearing converted into the rotating of a propeller shaft, novel steering devices being also provided.

BURNISHER.—Thomas Lloyd, Boston, Mass. This is a tool designed to facilitate the burnishing of boots and shoes, stoves, and hot articles of various kinds, and all kinds of metallic ware, a convenient means of tightening the rubbing surface of the burnisher being provided, so that it may always do the most efficient work. The burnisher tube is of flexible material and has a separate head in each of its ends, a central rod connecting the ends, and there being a screw tension mechanism for forcing the heads apart and stretching the tube. The nature of the body or rubbing surface depends upon the use to which the implement is to be put.

ROAD CART.—Charles H. Kallbreier, Tell City, Ind. The body of this vehicle is suspended upon its springs in a manner designed to insure its riding easily and being kept perfectly level, while a person may easily get into and out of it by means of a rear step, the seat swinging to one side. Combined with the cart body and its supporting gear is a transverse front end spring supported by the shafts, and a hinged connection between the middle of the spring and the middle of the front of the body. When two or more persons are in the cart the spring is compressed, and the plate supporting it may be adjusted so that the body and spring will assume the correct relative position.

GRATE.—Frederick Carel and Wayland F. Davidson, Charleston, West Va. This is a grate which may be used to heat a single room, or for two, three, or four adjoining rooms, forming a recessed grate in one room and a projecting grate in another. It is journaled on a base, with a socket which turns on a pin, and plates fitting in grooves in the base plates fit at their outer edges closely to the walls of the fireplace, lap plates lapping against the sides of these plates. A partition may be employed to divide the grate into compartments, the partition being hollow, and open at its upper and lower ends. In using the grate for different rooms the passage of light or sound between the rooms is prevented.

A ROCKING AND INVALID CHAIR.—Harris W. Stern, La Salle, Ill. This is a combination construction, designed to be used as a reclining chair, a rocking chair, or a chair for use in nursing the sick, means being provided for carrying the foot rest up to a level with the seat, or placing it at any desired angle but a slight distance above the floor. Combined with a platform rocker is a sliding frame, swinging vertically at its outer end when slid outward, a rest being pivoted to the frame, and secured in folded position by latches, while folding legs are pivoted to the forward end of the rest.

PEN OR PENCIL CARRIER.—Herbert E. Thornhill, Lyons, N. Y. This is a device made of wire in the form of a V-shaped loop, its arms having eyes to receive the pencil or penholder, and one of the arms having also an eye to receive the fourth finger, while an offset or loop is made to cover the position of the first finger. The device is designed to fit comfortably over and around the fingers, and carry and guide the pencil or pen in writing.

AUTOMATIC BOTTLE STOPPER.—Richard G. Williams, L'Anse, Mich. Upon an adjustable band around the bottle neck is hinged a swinging lid, a sliding rod moving in keepers on the side of the bottle being connected with the lid, which is closed by upward pressure upon the rod. The rod extends below the bottom of the bottle, so that when the latter is at rest on a shelf or table, the lid is closed, but the moment the bottle is raised the lid flies open.

FENCE WEAVING MACHINE.—William Lowden, Middleville, Mich. This is a simple machine adapted to run upon and spread the stretched fence wires and weave with them a series of fence pickets, the device obviating the necessity of separate tracks, while being easily and rapidly operated to make a very substantial fence. A main feature of the improvement is a sprocket wheel having a hollow hub with channels within and on opposite sides, and rollers journaled at one end of the hub, the strands of each pair of wires being passed through the wheel and held in the opposite channels, the wheels being revolved to twist the wires after each picket is dropped in place.

FLOWER HOLDER.—Silvie Lord, New York City. This holder has the form of a circular pan with flaring sides, in which a central cylindrical compartment of greater height, around which are supported by wires outwardly inclined tubes, both the pan and central compartment being supplied with water. By placing flowers in and around the inclined tubes and centrally, great facility is afforded for their artistic and natural grouping, while the flowers will be securely held and abundantly supplied with water.

SLATING COMPOUND.—John B. Coles, Bayonne, N. J. This is a compound of soluble glass, alumina, and other ingredients, to impart to various substances or articles to which it is applied a surface which may be readily written upon, while the marks may be quickly erased with water and a sponge or cloth.

GOPHER TRAP.—George Moor, La Fayette, Oregon. This device has a spring-pressed spear engaged by a pivoted trigger, a swinging bait lever being connected with one end of the trigger, the construction being such that the mechanism will be tripped when the gopher attempts to pass beneath the trap. The device is also designed to be used for killing other small animals.

DESIGN FOR A SPOON.—Thomas H. Bates and Albert O. Quimby, Fresno, Cal. On the handle of this spoon are represented the two hemispheres apparently joined by clasped hands, over which are figures of caravels or small vessels, while in the bowl of the spoon is a bird's-eye view of the Columbian Exposition.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

BULLETIN No. 4, GEOLOGICAL SURVEY OF ALABAMA. Report on the geology of N. E. Alabama and adjacent portions of Georgia and Tennessee. By C. Willard Hayes, Assistant Geologist in Charge. 12mo. Pp. 85. Map.

This pamphlet treats of topography, drainage, stratigraphy and structure of the district. The older method of measuring lines across the country at intervals of ten miles has been dropped and the geological data was at first placed directly upon the topographic map, but this method has been modified by discarding the plane table and plotting all lines in the notebook. The work is accompanied by an excellent map of the district.

SCIENTIFIC AMERICAN

BUILDING EDITION.

NOVEMBER NUMBER.—(No. 85.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing a very handsome block of residences near Riverside Park, New York City. Floor plans and two perspective elevations. Lamb & Rich, architects, New York.
2. Plate in colors showing a colonial residence at Cranford, N. J. Perspective views and floor plans. Cost $6,000 complete. Mr. Oscar S. Teale, architect, New York. An excellent design.
3. A summer cottage at Asbury Park, N. J. Perspective view and floor plans. Cost $3,400 complete. C. M. Dissosway, architect, New York.
4. A pretty cottage erected at Dubuque, Iowa, at a cost of $1,650. Floor plans, perspective, etc.
5. A double dwelling house erected at Springfield, Mass., at a cost of $10,495 complete. Mr. B. H. Seabury, architect, Springfield, Mass. A model design. Floor plans and perspective.
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References to former articles or answers should give date of paper and page or number of question.

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(4588) C. W. W. writes: I have two solutions of pig iron, one in HnO_3 (sp. gr. 1·2) one in HCl (sp. gr. 1·1) The residue from the HnO_3 solution contained little if any carbon. Does this indicate that there is little or no graphitic carbon in the sample? In the HCl solution the residue contains considerable carbon. Can this be precipitated combined carbon? 1. Is graphitic carbon in pig iron soluble in HnO_3 (sp. gr. 1·2)? 2. Is combined carbon in pig iron precipitated by solution of the iron in HCl (sp. gr. 1·1)? 3. What is the peculiar odor emitted when pig iron is acted upon by HCl? A. Undoubtedly, were heat applied in the solution, the nitric acid might dissolve much of the graphitic carbon. By solution in HCl a great part of the combined carbon escapes as hydrocarbons. The peculiar odor you speak of is largely due to these. If gently heated, and if the hydrochloric acid is of sufficient strength, all the combined carbon will escape as hydrocarbons. To obtain all the carbon a perfectly neutral cold solution of cupric chloride may be used. This dissolves the iron and leaves all the carbon.

(4589) A. B. Y. asks how to split paper. A. Coat both sides of the paper to be split with flour paste, working well into the paper. Take two pieces of stout white muslin and paste one on each side of the paper. Smooth down carefully, remove excess of paste and allow the whole to dry thoroughly. Artificial heat may be used if desired to hasten the drying. When dry, grasp the two pieces of cloth firmly, one in each hand, and pull slowly and evenly. The paper should split in the

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middle, leaving the cut or printing on each side. The appearance, of wood cuts is improved by this method, as it gives the soft effect of an artist's proof on India paper. Many magazine or illustrated newspaper cuts may be split and mounted into books to illustrate them more fully. The effects obtained are really surprising.

(4590) G. E. C.—A correspondent of the *Lancet* states that he has found the following preparation most useful in cases of falling of the hair:

Tincture of jaborandi	½ oz.
Lanoline	3 drm.
Glycerine	2 oz.

Mix (by the aid of a little soft soap). A little to be rubbed in every night.

(4591) Mr. G. H. S. writes: In this city (Pueblo, Colorado) we have an electric line controlled by one power house and on one circuit of over 25 miles. One track from the Bessemer steel works to near the Overton oil refinery (both suburbs of Pueblo) is about 14 miles long, and its branches make up the rest. There are about 30 cars, some with one to three trailers, at work at one time, each car with two motors of 40 horse power using up to 50 amperes of current. This is the longest line on one circuit known to me.

(4592) F. G. asks: In calculating, how would you go about figuring the size and weight of a fly wheel for a certain size engine? In what proportion in area is the suction and discharge pipe to the water cylinder on a pump for boiler feeding, and others also? A. The sizes of fly wheels vary considerably with different makers and for the different uses of the engine, as well also the weight; 3 to 5 times the length of the stroke is about the range for diameter, and from 70 to 100 ponnds per indicated horse power for the weight is a common practice with makers of Corliss engines. The lighter weights are assigned to engines running machinery of uniform load. The unequal pressure during the stroke by an early cut-off is also an essential factor. You will find the formulas for the different kinds of engines, with explanations and examples, in Nystrom's "Mechanics," pp. 446, 447, $3.50 mailed. The relative diameters of suction and force pipes for boiler feeding vary by one size of the usual iron pipe sizes. For long suctions or long discharge there should be an additional size for a long pipe.

(4593) G. W. J. asks for the formula for finding the ratios for the months, for finding the day of week that any given date of month falls upon. A. You will find the tables of the ratios for sixty centuries, and the ratios for the months, with examples for working the computation and an explanation of the old and new style calendar in relation to the days of the week, in SCIENTIFIC AMERICAN SUPPLEMENT, No. 879, 10 cents mailed.

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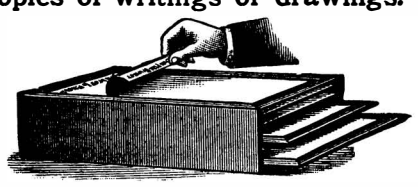
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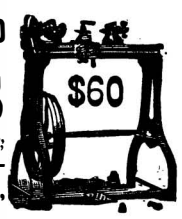

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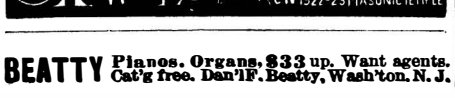

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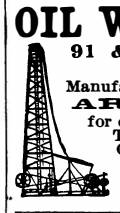
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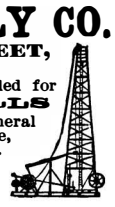

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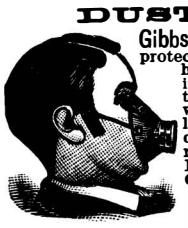
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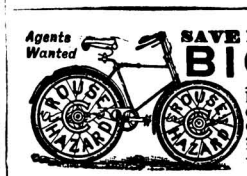

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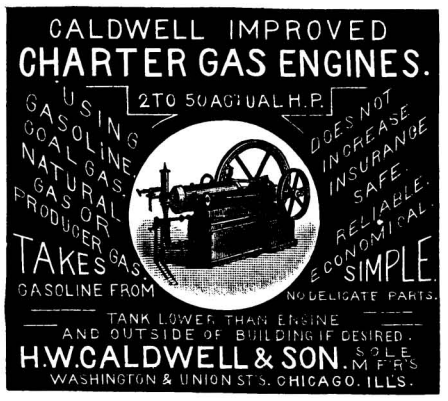

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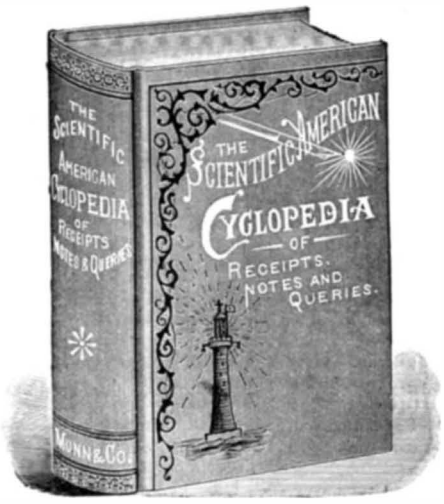

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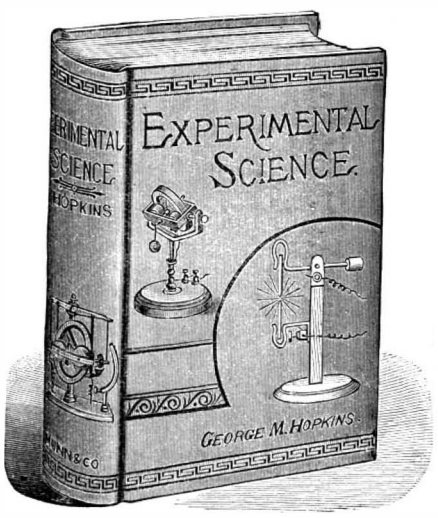

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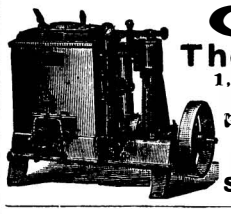

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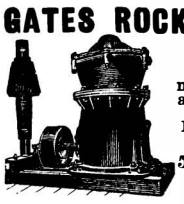

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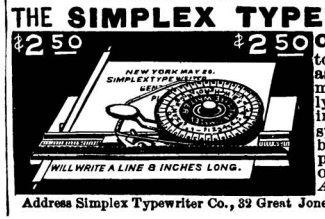

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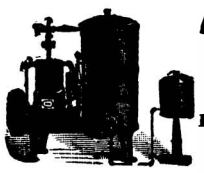

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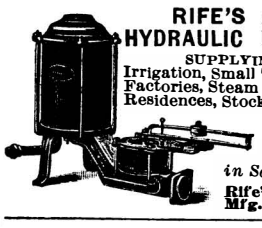

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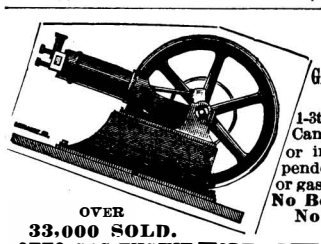

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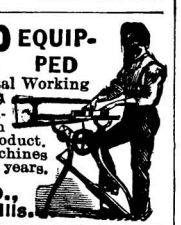

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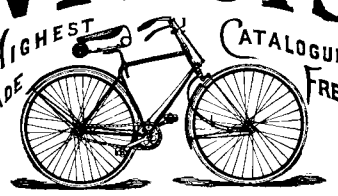

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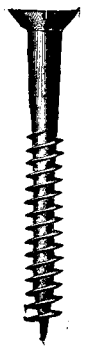

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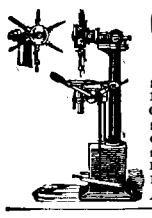

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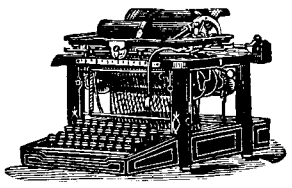

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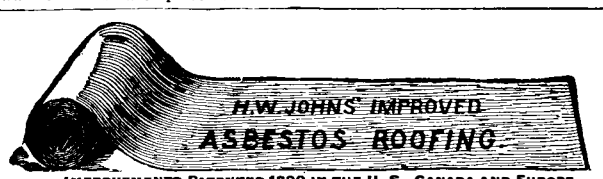

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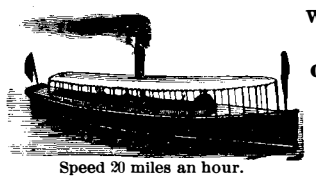

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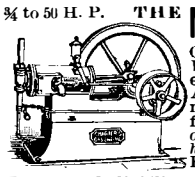

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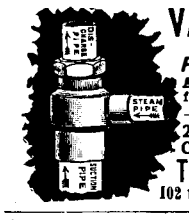

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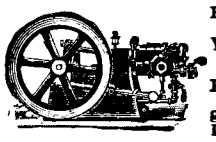

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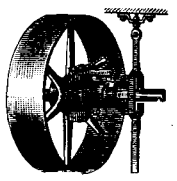

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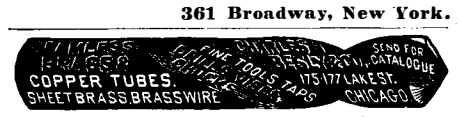

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